

Diploma in Packaging Technology

IV Semester

General Time Schedule

Periods Format

Semester - IV

Sl No	Course Code	Course Name	Teaching Scheme					Examination Scheme						
			instruction periods per week			Total Periods per semester	Credits	Continuous internal evaluation			Semester end examination			
			L	T	P			mid sem1	mid sem2	internal evaluation	Max Marks Min Marks	total marks	Min marks for Passing including internal	
1	18PKG-401C	Advanced Engineering Mathematics	3	1	0	60	3	20	20	20	40	14	100	35
2	18PKG-402C	Strength of Materials and Fluid	3	1	0	60	3	20	20	20	40	14	100	35
3	18PKG-403C	Thermal Engineering	3	1	0	60	3	20	20	20	40	14	100	35
4	18PKG-404C	Packaging Materials and Test procedures	3	1	0	60	3	20	20	20	40	14	100	35
5	18PKG-405C	Package Design Engineering and Printing	3	1	0	60	3	20	20	20	40	14	100	35
6	18PKG-406P	Component Drawing	1	0	2	45	1.5	20	20	20	40	20	100	50
7	18PKG-407P	Plastic Materials Testing Lab Practice	1	0	2	45	1.5	20	20	20	40	20	100	50
8	18PKG-408P	Package Design Lab Practice	1	0	2	45	1.5	20	20	20	40	20	100	50
9	18PKG-409P	Material Testing Lab Practice	1	0	2	45	1.5	20	20	20	40	20	100	50
10	18PKG-410P	Advanced Communications and Life skills Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
11		Academic activities	0	0	7	105	2.5	0	0	Rubrics			--	-
			20	5	17	630	25	200	200	200	400	170	1000	425
Activities: student performance is to be assessed through Rubrics														

All the above marks are in percentage weightage

ADVANCED ENGINEERING MATHEMATICS

Course Title	: Advanced Engineering Mathematics	Course Code	: 18PKG-401F
Semester	: IV	Course Group	: Foundation
Teaching Scheme in periods (L : T :P)	: 45 : 15 : 0	Credits	: 3
Methodology	: Lecture + Tutorial	Total Contact Periods	: 60
CIE	: 60 Marks	SEE	: 40 Marks

Pre requisites

This course requires the knowledge of Engg. Mathematics at Diploma first year level and Applied Engg. Mathematics at Diploma 3rd Semester level.

Course Outcomes :

At the end of the course, the student will have the ability to:

CO 1	Solve simple Homogeneous Linear Differential Equations
CO 2	Solve simple Non-Homogeneous Linear Differential Equations
CO 3	Express f(x) as a Fourier series in the given interval
CO 4	Express f(x) as a Fourier Half-Range Cosine series and Sine series
CO 5	Find Laplace transforms of simple functions
CO 6	Find Inverse Laplace transforms of simple functions and solve Linear Differential Equations using Laplace Transformations.

Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE			
			R		U	A
1	Homogeneous Linear Differential equations with constant coefficients	05	Q4	Q1	Q9(a)	Q13(a)
2	Non-Homogeneous Linear Differential equations with constant coefficients	15				
3	Fourier series	10		Q2	Q10(a)	Q14(a)
4	Fourier Half-range series	05				
5	Laplace Transforms	10		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)
						Q13(b), Q15(a), Q15(b)

6	Inverse Laplace transforms	15			Q7,Q8	Q10(b), Q12(a), Q12(b)	Q14(b), Q16(a), Q16(b)
Total		60	8			8	8

Course Contents:

Unit – I

Duration: 05 Periods (L:3.0 – T:2.0)

Homogeneous Linear Differential equations with constant coefficients

Homogenous linear differential equations with constant coefficients of order two and higher with emphasis on second order.

Unit – II

Duration: 15 Periods (L:12.0 – T:3.0)

Non-Homogeneous Linear Differential equations with constant coefficients

Non-homogenous linear differential equations with constant coefficients of the form $f(D)y = X$, where X is in the form $k(a \text{ constant})$, e^{ax} , $\sin ax$, $\cos ax$, x^n , ($n = 1, 2, 3$) Complimentary Function (CF), Particular Integral (PI) and General Solution (GS).

Unit-III

Duration: 10 Periods (L: 8.0 – T: 2.0)

Fourier series

Orthogonality of trigonometric functions, Representation of a function in Fourier series over the interval $(c, c + 2\pi)$, Euler's formulae, sufficient conditions for existence of Fourier series for a function. Even, Odd functions and Fourier series over the Interval $(0, 2\pi)$ and $(-\pi, \pi)$

Unit – IV

Duration: 05 Periods (L: 3.0 – T: 2.0)

Fourier Half-range series

Representation of a function as Fourier Half-range Sine series and Cosine series over the interval $(0, \pi)$

Unit – V

Duration: 10Periods (L: 7.0 – T:3.0)

Laplace Transformations:

Definition, sufficient conditions for existence of Laplace Transform, Laplace Transform of elementary functions, linearity property, Change of scale property, First shifting theorem ,

multiplication by t^n , division by t , Laplace Transform of derivatives and integrals, unit step function, Laplace Transform of second shifting theorem

Unit – VI

Duration: 15 Periods (L: 12.0 – T: 3.0)

Inverse Laplace transforms:

Inverse Laplace transforms- shifting theorems and change of scale property, multiplication by s^n and division by s –Inverse Laplace Transform using partial fractions – convolution theorem (no proof) – application of Laplace Transformations to solve ordinary differential equations of second order with initial conditions.

Recommended Books:

1. Higher Engineering Mathematics, B.S.Grewal .
2. Laplace Transforms - Murray R. Spiegel .
3. Ordinary Differential Equations – R. S. Aggarwal.
4. Fourier Series – A.R. Vasishtha and Gupta.

Suggested E-Learning references:

1. www.freebookcentre.net/mathematics/introductory-mathematics-books.html
2. E-books:www.mathebook.net

Suggested Learning Outcomes

Unit-I

1.0 Solve Homogeneous linear differential equations with constant coefficients in engineering situations

- 1.1 Solve Differential equations of the type $(aD^2 + bD + c)y = 0$ when the roots of the auxiliary equation are real and different, real and repeated, complex.
- 1.2 Solve the higher order homogeneous Linear differential equations with constant coefficients.

Unit-II

2.0 Solve Non Homogeneous linear differential equations with constant coefficients in engineering situations

- 2.1 Explain the concept of complementary function, particular Integral and general solution of a differential equation.
- 2.2 Solve n^{th} order differential equation of the type $f(D)y = X$ where $f(D)$ is a polynomial of second order and X is a function of the form $k, e^{ax}, \sin ax, \cos ax, x^n$.
- 2.3 Solve simple problems on the above types of 2.2

Unit-III

3.0 Understand the Fourier series expansion of functions

- 3.1 Define the orthogonality of functions in an interval.
- 3.2 Define Fourier series of a function on the interval $(C, C+2\pi)$ and write the Euler's formulae for determining the Fourier coefficients.
- 3.3 Write sufficient conditions for the existence of Fourier series for a function.
- 3.4 Write Fourier series of simple functions in the range $(0, 2\pi)$ and $(-\pi, \pi)$.
- 3.5 Write Fourier series for even and odd functions in the interval $(-\pi, \pi)$
- 3.6 Solve simple problems on even and odd functions in the interval. $(0, 2\pi)$ and $(-\pi, \pi)$

Unit- I

4.0 Understand the Half – Range Fourier series expansion of functions

- 4.1 Write Half – Range Cosine series of a function in the range $(0, \pi)$.
- 4.2 Write Half – Range Sine series of a function in the range $(0, \pi)$.
- 4.3 Solve simple problems on Half – Range Cosine and Sine series over the interval $(0, \pi)$

Unit-V

5.0 Understand Laplace transforms

- 5.1 Write the definition of Laplace Transform and Laplace transform of standard functions.
- 5.2 Explain the sufficient conditions of existence of Laplace Transform.
- 5.3 Write the properties of Laplace Transform – Linearity property, First shifting theorem,

Change of Scale property.

- 5.4 Solve simple problems using the above properties.
- 5.5 Write formulae for Laplace transform of $t^n f(t)$, $\frac{f(t)}{t}$, $f^n(t)$, $\int_0^t f(u) du$ in terms of Laplace transform of $f(t)$
- 5.6 Solve simple problems using the above formulae.
- 5.7 Define unit step function and write the Laplace Transform of unit step function.
- 5.8 Write Second shifting theorem.

Unit-VI

6.0 Use Laplace transforms and Inverse Laplace transforms to solve differential equation in engineering problems

- 6.1 Define inverse Laplace Transform and write inverse Laplace Transforms of standard functions.
- 6.2 Solve simple problems on Inverse Laplace Transforms.
- 6.2 Write Shifting theorems and Change of scale property of inverse Laplace Transform.
- 6.3 Solve simple problems on 6.2
- 6.4 Write inverse Laplace Transforms corresponding to Laplace Transform of the functions $t^n f(t)$, $\frac{f(t)}{t}$, $f^n(t)$, $\int_0^t f(u) du$
- 6.5 Solve simple problems on 6.4
- 6.6 Define convolution of two functions and state convolution theorem.
- 6.7 Solve simple problems on Convolution theorem.
- 6.8 Use Laplace and inverse Laplace Transforms to solve simple differential equations of Second order.

Suggested Student Activities:

1. Student visits Library to refer Standard Books on Mathematics and collect related material.

2. Quiz
3. Group discussion
4. Surprise tests
5. Seminars
6. Home Assignments.

CO-PO Mapping Matrix

	Basic knowledge	Discipline Knowledge	Experiments and practice	Engineering Tools	Engineer and society	Environment & sustainability	Ethics	Individual and Team work	Communication	Lifelong learning	Linked PO
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	
CO1	3	2	2	1			1			3	1,2,3,4,7,10
CO2	3	2	2	1			1			3	1,2,3,4,7,10
CO3	3	2	2	1			1			3	1,2,3,4,7,10
CO4	3	2	2	1			1			3	1,2,3,4,7,10
CO5	3	2	2	1			1			3	1,2,3,4,7,10
CO6	3	2	2	1			1			3	1,2,3,4,7,10

Internal Evaluation

Test	Units	Marks
Mid Sem 1	1 and 2	20
Mid Sem 2	3 and 4	20
Slip Test 1	1 and 2	5
Slip Test 2	3 and 4	5
Assignments	-	5
Seminars	-	5
	Total	60

QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	4	1	Nil	4 Marks
02	Part-B	Understanding(U)	4	3	2	6 Marks
03	Part-C	Application(A)	4	5	2	10 Marks
Total Marks						20 Marks

MID SEM-I EXAM

S.No	Unit No	R	U	A	Remarks
1	Unit-I	1,2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-II	3,4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

MID SEM-II EXAM

S.No	Unit No	R	U	A	Remarks
1	Unit-III	1,2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-IV	3,4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

The length of answer for each question framed in respect of Part-A, B&C shall not exceed $\frac{1}{4}$ of a page, 1page and 2 pages respectively

QUESTION PAPER PATTERN FOR SEMESTER END EXAM

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	8	1	Nil	8 Marks
02	Part-B	Understanding(U)	8	3	4	12 Marks
03	Part-C	Application(A)	8	5	4	20 Marks
Total Marks						40 Marks

Unit No	Questions to be set for SEE				
	R		U		A
I	Q4	Q1		Q9(a)	Q13(a)
II					
III		Q2		Q10(a)	Q14(a)
IV					
V		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
VI					
Total Questions	8		8	8	

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
BOARD DIPLOMA EXAMINATIONS
MID SEM –I, MODEL PAPER, IV SEMESTER
ADVANCED ENGINEERING MATHEMATICS

TIME: 1: 00 Hours

Max. Marks: 20

PART-A

Instructions: 1. Answer **ALL** questions 04 X 01 = 04
 2 Each question carries **ONE** mark

1. Write the General solution of $(aD^2+bD+c)y = 0$, whose roots of auxiliary equation are real and distinct.
2. Find the roots of auxiliary equation of the differential equation $(D^2 + 2D + 1)y = 0$
3. Find the Particular Integral of $(D^2 - 4D + 1)y = e^{3x}$
4. Find the P.I of $(D^2 - 16)y = \sin 4x$

PART-B

Instructions: 1. Answer any **TWO** questions 02 X 03 = 06
 2. Each question carries **THREE** marks

5 a) Solve: $(D^2 + 3D - 54)y = 0$

Or

5 b) Solve : $(D^2 + 16)y = 0$

6 a) Solve : $(D^2 + 4D + 4)y = e^{2x}$

Or

6 b) Find P.I of $(D^3 + D)y = \sin 2x$

PART C

Instructions: 1. Answer **ALL** questions 02 X 05 = 10
 2. Each question carries **FIVE** marks

7 a) Solve : $(D^3 - 2D^2 - 4D + 8)y = 0$

Or

7 b) Solve : $(D^3 - D^2 - D + 1)y = 0$

8 a) Solve : $(D^2 + 36)y = \sin^2 x$

Or

8 b). Solve : $(D^2 + 3D + 2)y = x^2$

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Code: 18PKG-401F

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
BOARD DIPLOMA EXAMINATIONS

MID SEM –II, MODEL PAPER, IV SEMESTER
ADVANCED ENGINEERING MATHEMATICS

TIME: 1: 00 Hours

Max. Marks: 20

PART-A

Instructions:

1. Answer **ALL** questions

04 X 01 = 04

2 Each question carries **ONE** mark

1. Define periodic function and give one example
2. Define Fourier series of the function $f(x)$ in the interval $(0, 2\pi)$
3. Write Half-range sine series of $f(x)$ in the interval $(0, \pi)$
4. Find a_0 for $f(x) = e^x$ in $0 < x < \pi$

PART-B

Instructions:

1. Answer any **TWO** questions

02 X 03 = 06

2. Each question carries **THREE** marks

5 a). If $f(x) = x^2$ in $(0, 2\pi)$, then find the value of a_n in Fourier series of $f(x)$

Or

5 b) If $f(x) = |x|$ in $(-\pi, \pi)$, then find the value of a_1 in Fourier series of $f(x)$

6 a). Find the value of a_n in half-range Cosine series for the function $f(x) = e^x$ in $(0, \pi)$

Or

6 b). Obtain the Fourier Half – Range Sine series for $f(x) = (\pi - x)$ in the interval $(0, \pi)$

PART C

Instructions:

1. Answer any **TWO** questions

02 X 05 = 10

2. Each question carries **FIVE** marks

7 a). Obtain the Fourier series for $f(x) = x$ in the interval $0 < x < 2\pi$

Or

7 b). Find the Fourier series for $f(x) = (x - x^2)$ in the interval $(-\pi, \pi)$. Hence show that

$$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots + \frac{\pi^2}{12}$$

8 a) Express $f(x) = \pi x - x^2$ as a half-range Sine series in $(0, \pi)$

Or

8 b). Find the half –range cosine series for the function $f(x) = x^2$ in the interval $(0, \pi)$

18PKG-401F

BOARD DIPLOMA EXAMINATION, (C-18)
SEMESTER END EXAM MODEL PAPER
IV SEMESTER EXAMINATION
ADVANCED ENGINEERING MATHEMATICS

Time: 2 hours

[Total Marks: 40]

PART-A

Instructions:

1. Answer **ALL** questions

08 X 01 = 08

2 Each question carries **ONE** mark

1. Find the roots of auxiliary equation of the differential equation $(D^2 + 4D)y = 0$.
2. Define Fourier Series for the function $f(x)$ in the interval $(c, c+2\pi)$
3. Find the Particular Integral of $(D^2 - 4D + 1)y = e^x$
4. Find $L(e^{2t} + \cos 3t)$
5. Find $L(t + 5\cos ht)$
6. State the First Shifting theorem of Laplace Transforms.
7. Find $L^{-1}\left(\frac{1}{s-3} + \frac{s}{s^2+4}\right)$
8. Find $L^{-1}\left(\frac{1}{2s+5}\right)$

PART-B

Instructions:

1. Answer any **FOUR** questions

04 X 03 = 12

2. Each question carries **THREE** marks

9. a) Solve: $(D^2 + D + 1)y = 4e^{3x}$

Or

- 9 b) Find $L(t\cos 3t)$

- 10 a) Find Half Range Sine Series of $f(x) = x$ in $(0, \pi)$

Or

10 b) Find $L^{-1} \left(\frac{s+1}{s^2+6s-7} \right)$

11 a) If $L\{f(t)\} = \frac{20-4s}{s^2-4s+20}$, find $L\{f(3t)\}$

Or

11 b) Find $\int_0^{\infty} t \cdot e^{-2t} \sin 3t dt$ using Laplace Transform Technique

12 a) Show that $L^{-1} \left(\frac{1}{s(s^2+a^2)} \right) = \frac{1-\cos at}{a^2}$

12 b) Find $L^{-1} \left(\frac{s}{(s+2)^2+4} \right)$

PART C

Instructions: 1. Answer any **FOUR** questions

04 X 05 = 20

2. Each question carries **FIVE** marks

13. a) Solve : Solve: $(D^2 + D - 2) y = x + \sin x$

Or

13 b) Find $L[te^t \sin 3t]$

14 a) Expand $f(x) = x^2$ as a Fourier series in the interval $(-\pi, \pi)$

Or

14 b) Find $L^{-1} \left(\frac{s}{(s+1)^2(s^2+1)} \right)$

15 a) Find $L \left(\frac{\sin 3t \cdot \cos t}{t} \right)$

Or

15 b) Evaluate $L \left\{ \int_0^t \frac{\sin t}{t} dt \right\}$

16 a) Find $L^{-1} \left(\frac{1}{(s+1)(s+2)} \right)$ using Convolution theorem .

Or

16 b). Solve the differential equation $y'' - 2y' - 8y = \sin t$, when $y(0) = 3$, $y'(0) = 6$ by

Laplace Transform method.

Department of Technical Education

State Board of Technical Education & Training (TS)

Course Title :	STRENGTH OF MATERIALS AND FLUID MECHANICS	Course Code	18PKG-402C
Semester	IV	Course Group	:Core
Teaching Scheme in Hrs(L:T:P)	30:15:0	Credits	: 3
Methodology	Lecture + Assignments	Total Contact Hours :	:45Hrs/60Pds
CIE	60 Marks	SEE	40 Marks

Pre requisites

Knowledge of basic mathematics and Applied Science

Course Outcomes

CO1	Explain the mechanical properties and describe the different types of stress, strains and elastic constants and compute the factor of safety in sustainability of material aspects
CO2	Interpret the Variation of moment of inertia for different Mechanical Engineering Sections
CO3	Draw and Compare the shear force and bending moment diagram on beams under varying load conditions
CO4	Define the terminology related to fluid properties, pressure and its measurements and compute forces on immersed vertical plane surfaces. Apply the hydraulic principles in solving problems on discharge and pressure measurements using flow measuring devices. To analyse the forces and its head
CO5	Verify the flow parameters related to pipes to measure the various losses of head through pipes
CO6	Apply knowledge and Select, operate and maintain various pneumatic elements for a particular low cost automation application in sustainable manufacturing system and its impact on society.

MID SEM –I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM –II EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	

2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

SEMESTER END EXAMINATION							
Sl No	Unit No.	Questions to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9(a)	13(a)	
2	II						
3	III		2		10(a)	14(a)	
4	IV						
5	V		3	5, 6	9(b)	13(b)	
					11(a)	15(a)	
		11(b)			15(b)		
6	VI		7,8	10(b)	14(b)		
				12(a)	16(a)		
				12(b)	16(b)		
Total Questions		8		8	8		
Legend:		Remembering (R)		1 Mark			
		Understanding (U)		3 Marks			
		Application (A)		5 Marks			

Course Content

UNIT 1 SIMPLE STRESS AND STRAINS

Duration: 10 Periods.

Application of static's, To identify the nature and effect of tensile, compressive and shear forces, To define the terms stress, strain, modules of elasticity, poison's ratio, To draw typical stress vs strain curve for a M.S Specimen, To mention the significance of factor of safety, To compute stress, strain, values on uniform sections and composite sections. To write the relation between elastic constants E,N,K & 1/m. STRAIN ENERGY: To know the meaning of resilience, To write an expression for resilience. To compute instantaneous stress developed in bodies subjected to gradual / sudden / impact loads

UNIT 2 GEOMETRIC PROPERTIES OF SECTION.

Duration: 10 Periods

Centre of Gravity, Moment of Inertia & its Importance -Parallel & Perpendicular Axis Theorem-C.G of Rectangle, Triangle, Circle, Finding CG of T-Section, I-Section, L-Section and Channel Section. Moment of Inertia about C.G for I section, T section. L-section and Channel Section.

UNIT 3 SHEAR FORCE BENDING MOMENT DIAGRAMS Duration: 10 Periods

Definition - Shear Force and Bending Moment –Types of beams, types of load acting on beams ,Sagging & Hogging Bending Moment and its importance –sign convention to draw

SFD and BMD- Concept of Maximum bending moment, Point of Contra flexure & its importance -Drawing S.F & B.M Diagram for Cantilever, Simply Supported Beams subjected to Point Load and U.D.L

UNIT 4 - PROPERTIES AND BEHAVIOR OF FLUIDS DURATION: 10 Periods

Define a fluid- Differentiate between compressible and incompressible fluids-State the various units used in Hydraulics-Define various properties of fluids and state their units, Define intensity of pressure, differentiate the gauge, absolute pressure and vacuum pressure and state their units. Explain the working principle of various instruments used for determining the pressure of Fluids.

Distinguish between laminar flow and turbulent flow, State the various types of energies and the total energy-Know about the velocity of a flowing liquid. Understand the discharge equation and equation of continuity of flow-State Bernoulli's equation and its application in hydraulics-Solve problems (simple) on law of continuity flow,. Bernoulli's equation, Explain the working principle of venturi meter, Pitot tube, water and current meters-Solve simple problems and venturi meter.

UNIT 5 FLOW THROUGH PIPES Duration: 10 Periods

Mention the equation for loss of head due to friction in pipes. State Darcy's and Chezy's formulae, Explain the hydraulic gradient and total energy line. Calculate the velocity of flow, discharge and diameter of pipes. connecting two reservoirs, Explain how the power can be transmitted through pipes carrying liquid under pressure Express the condition for maximum H.P through pipes-Solve simple problems on power transmission through pipes

UNIT 6 HYDRAULIC& PNEUMATIC CIRCUITS Duration:10 Periods

control system, merits and demerits, Component of hydraulic circuits- Know briefly about types of hydraulic pumps ,Intensifier, Accumulator- control system, merits and demerits-Component of hydraulic circuits, Know briefly about types of hydraulic pumps ,Intensifier, Accumulator-Applications of Pneumatics-Pneumatic symbols

Recommended Books

- | | | |
|---|--------------------------------|-----------------------|
| 1 | Strength of Materials | - singer |
| 2 | Mechanics of structure | - S.B junnarkar |
| 3 | Strength of materials | - Khurmi |
| 4 | Strength of Materials | - Ramamrutham. |
| 5 | Fluid Mechanics and pneumatics | - M. Zakria Baig |
| 6 | Hydraulics | - Malhotra & Malhotra |
| 7 | Pneumatics | - P. Srihari Rao |

SUGGESTED LEARNING OUTCOMES

1. SIMPLE STRESS AND STRAINS

Identify the nature and effect of tensile, compressive and shear loads and forces.

Know the terms stress, strain, modulus of elasticity, Poisson's ratio.

Write Hooke's law

Draw stress – strain curve for ductile and brittle materials, salient points on curve.

Solve simple problems on above equations.

Know the Strain Energy

Compute instantaneous stress developed in bodies subjected to gradual / sudden / impact loads

Solve simple problems on strain energy.

2. GEOMETRIC PROPERTIES OF SECTION.

Understand the geometric properties of machine members

Locate the C.G of a given section

Explain the meaning of the term moment of Inertia

Write the perpendicular & parallel axis theorem

Calculate the center of gravity of T,L,C,I sections.

Calculate moment of inertia of T,L,C,I sections only.

3. SHEAR FORCE BENDING MOMENT DIAGRAMS

Know the Shear Force and Bending Moment

Classify the types of beams, types of load acting on beams.

Deeds sign convention to draw SFD and BMD

Concept of Maximum bending moment, Point of Contra flexure & its importance

Drawing S.F & B.M Diagram for Cantilever, Simply Supported Beams subjected to Point Load and U.D.L

4. PROPERTIES AND BEHAVIOR OF FLUIDS

Understand the fluid dynamics

State the various units used in Hydraulics.

Differentiate the gauge, absolute pressure and vacuum pressure and state their units.

Distinguish between laminar flow and turbulent flow

Write the different types of pressure measuring devices.

Solve problems (simple) on law of continuity flow

Develop Bernoulli's equation

Explain the working principle of venturi meter, Pitot tube, water and current meters

Solve simple problems and venturi meter.

5. FLOW THROUGH PIPES

Mention the equation for loss of head due to friction in pipes

Explain the hydraulic gradient line and total energy line.

Calculate the velocity of flow, discharge and diameter of pipes

Explain how the power can be transmitted through pipes carrying liquid under pressure
Solve simple problems on power transmission through pipes

6. HYDRAULIC& PNEUMATIC CIRCUITS

Summarize the hydraulic control systems
Know briefly about types of hydraulic pumps and motors.
Categorize the Intensifiers, Accumulators and their –purpose
Identification of pneumatic symbols and circuits
Discuss the areas of applications of pneumatic power units

Suggested Student Activities

1. Market Survey specific to properties of Various type of Materials used in Mechanical Engineering and make report.
2. Calculate Moment of Inertia of Fly Wheel of engine present in your laboratory
3. Ask the students to Study of a jet pump and submersible pump used in the fields
4. Take the students to nearby earthmoving equipment (JCB) servicing work shop; ask to observe the hydraulic circuit installed in earthmoving equipment. Make the sketch and analyze its operation.
5. Study of trouble shooting procedures of various hydraulic and pneumatic circuits
6. Study and think an oil power circuit for an application beyond the syllabus and Draw the circuit diagram , submit hand written report of 500 words.
7. Study and think an pneumatic circuit for an application beyond the syllabus and Draw the circuit diagram , submit hand written report of 500 words.
8. Quiz
9. Group discussion
10. Surprise test

Suggested e-Resources:

1. www.nptel.iitm.ac.in/courses/.../IIT.../lecture%2023%20and%2024htm
2. www.wikipedia.org/wiki/Shear_and_moment_diagram
3. www.freestudy.co.uk/mech%20prin%20h2/stress.pdf
4. www.engineerstudent.co.uk/stress_and_strain.html
5. https://www.iit.edu/arc/workshops/pdfs/Moment_Inertia.pdf

CO-PO Mapping Matrix

Course Outcome		CL	Linked PO	Teaching periods
CO1	Explain the mechanical properties and describe the different types of stress, strains and elastic constants and compute the factor of safety in sustainability of material aspects	R/U	1,2	12
CO2	Interpret the Variation of moment of inertia for different Mechanical Engineering Sections	R/U/A	1,2,5	8
CO3	Draw and Compare the shear force and bending moment diagram on beams under varying load conditions	R/U/A	1,2,3,8,9,10	12
CO4	Define the terminology related to fluid properties, pressure and its measurements and compute forces on immersed vertical plane surfaces. Apply the hydraulic principles in solving problems on discharge and pressure measurements using flow measuring devices. To analyse the forces and its head	R/U/A	1,2,9	8
CO5	Verify the flow parameters related to pipes to measure the various losses of head through pipes	R/U/A	1,2,9,10	12
CO6	Apply knowledge and Select, operate and maintain various pneumatic elements for a particular low cost automation application in sustainable manufacturing system and its impact on society.	R/U/A	1,2,6,9	8
				60

MODEL QUESTION PAPER
BOARD DIPLOMA MID-SEMESTER EXAMINATIONS (C-18)
D.PKGT – IV - SEMESTER EXAMINATION
18PKG-402C STRENGTH OF MATERIALS AND FLUID MECHANICS

TIME: 1 HOUR

MAXIMUM MARKS: 20

PART –A

MARKS: 4 X 1 = 4

NOTE: Answer ALL questions. Each question carries ONE marks.

1. Define stress
2. State Hooke's law?
3. Define moment of inertia
4. Define Viscosity?

PART –B

MARKS: 2 X 3 = 6

NOTE: Answer ALL questions. Each question carries THREE marks.

- 5 (a). Draw stress – strain diagram for mild steel and explain the salient points on it
(OR)
- 5 (b). A steel rod of 20mm diameter 600 mm long is subjected to an axial pull of 40 kN.
Determine the stress.
- 6 (a). Define centroid and centre of gravity
(OR)
- 6 (b). Write short notes on
i. Resilience ii. Proof resilience iii. Modulus of resilience

PART –C

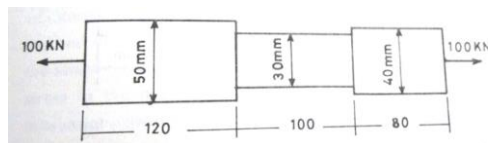
MARKS: 2 X 5 = 10

NOTE: Answer ALL questions. Each question carries FIVE marks.

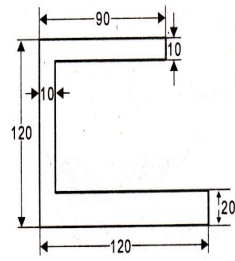
- 17(a). A bar 3 m long and 50 mm diameter hangs vertically and has a collar securely attached to the lower end. Find the maximum instantaneous stress induced when a
i) Weight of 2500 N falls through a height of 130mm on to the collar.
ii) Weight of 25000 N falls through a height of 13mm on to the collar.
Take $E = 2 \times 10^5 \text{ N/mm}^2$

(OR)

- 7(b). A bar of varying section is loaded as shown in Fig. Determine the total elongation.
Take $E = 2.0 \times 10^5 \text{ N/mm}^2$

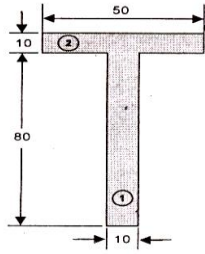


- 8(a). Calculate the C.G of the given section



(OR)

8(b). Calculate the C.G of the given section



MODEL QUESTION PAPER
BOARD DIPLOMA SEMESTER END EXAMINATIONS (C-18)
D.PKGT – IV - SEMESTER EXAMINATION
18PKG-402C STRENGTH OF MATERIALS AND FLUID MECHANICS

TIME: TWO HOURS

MAXIMUM MARKS: 40

PART –A

MARKS: 8 X1 = 8

NOTE: Answer ALL questions. Each question carries ONE marks.

1. Define stress and strain ?
2. Define strain energy and explain how it is stored in a body?
3. Find the M.I of rectangle of width 60mm and depth 40mm about its centroidal axes
4. Differentiate between Cantilever and simply supported beam
5. List out any six types of fluid flow.
6. What are the applications of Bernoulli's Theorem ?
7. Draw a neat sketch of venture meter and label its parts.
8. What are the various forms of energy .explain?

PART –B

MARKS:4 X3 =12

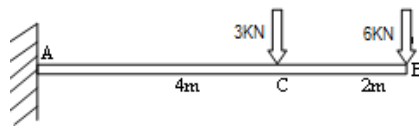
Answer ALL questions. Each question carries THREE marks.

9(a).A specimen of 40x60 mm cross section is subjected to a load of 35 kN. The specimen has 800 mm in length. Calculate the stress induced in the member.

(OR)

9(b).What is a venturi meter? How is it used in practice? Why it is used ?

10(a).Draw SF and BM diagram for the cantilever shown in Fig



(OR)

10(b).Draw the circuit symbols of various types of Accumulators

11(a).State and explain each term in Bernoulli's equation

(OR)

11(b).Explain the use of pitot tube

12(a).What are the different factors considered in the selection of accumulators

(OR)

12(b).Compare the pneumatic system with hydraulic system.

PART –C

MARKS:4 X5 =20

Answer ALL questions. Each question carries FIVE marks.

113(a). A m.s. bar of length 2m and has a diameter of 50 mm, hangs vertically. A load of 20kN falls on a collar attached to the lower end. Find the maximum stress when.

(a). Height of falls is 100mm

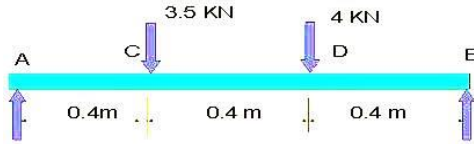
(b) Load is applied suddenly without impact

(c) The load is applied gradually. Assume $E = 2 \times 10^5 \text{ N/mm}^2$.

(OR)

13(b). Two reservoirs are connected by a 5000 m long and 1.5 m diameter C. I. pipe with $f = 0.01$. The difference in water levels in two reservoir is 25 meters. Determine the increase in discharge if the C. I. pipe is replaced with a smooth steel pipe of same size with $f = 0.005$

14(a). Draw the SF and BM diagram of simply supported beam 1.2 m long for the given loading



(OR)

14(b). Draw schematic diagram of external gear pump and explain its construction and working.

15(a). In a hydraulic power system, water is available at a head of 150 m and is to be carried through a pipe of length 500 m. Determine the minimum size of the pipe that will convey water for an output of 1000 kW at 90% efficiency. Take $f = 0.006$

(OR)

15(b). The pressure at the inlet of a pipe is 7000 kPa and the pressure drop is 700 kPa. The line is 15 km. Long. If 75 kW power is to be transmitted through this pipe line, find the diameter of the pipe and efficiency of transmission. Take $f = 0.006$ $w = 9.81 \text{ k N/m}^3$

16(a). Draw the line diagram of a screw pump and explain its working

(OR)

16(b). Explain the principle of operation of centrifugal pump with a sketch

18PKG-402C STRENGTH OF MATERIALS AND FLUID MECHANICS
QUESTION BANK

PART –A

1. Define malleability and Ductility.
2. What do you mean by Hardness.
3. Write different properties of materials and explain briefly.
4. Define Strength,
5. Define of Modulus of elasticity
6. Define Brittleness and Toughness:
7. Define Fatigue strength and Creep.
8. What is Stress and Strain ?
9. List out the types of loads ?
10. What are the types of stresses?
11. What is meant by modulus of elasticity ?
12. What are the units for POISSON'S RATIO?
13. Define Young's modulus?
14. What is bulk modulus?
15. Define centroid and centre of gravity
16. Define moment of inertia
17. What is a fluid?
18. What do you mean by a compressible fluid?
19. Define Viscosity?
20. Define kinematic viscosity?
21. What is surface tension?
22. What is compressibility?
23. What is an ideal fluid?
24. What is Capillarity?
25. Write any eight applications of hydraulic system?
26. List out the disadvantages of mechanical operated systems over other systems.
27. What are the advantages of hydraulic systems over mechanical systems?
28. Draw a line diagram of a hydraulic circuit and name the elements.
29. Write functions of hydraulic reservoir.
30. What are the functions of control valves?
31. How the pumps are classified?
32. Write the advantages of positive displacement pump.
33. What are the various hydraulic devices you have studied?
34. What is the purpose of hydraulic intensifier?
35. Explain the principle of working of hydraulic intensifier.
36. List out the various applications of intensifiers.
37. What is the purpose of Accumulator in a hydraulic circuit?
38. What are the different types of Accumulators available?
39. Define Pneumatic System
40. List various elements of a Pneumatic System
41. State the applications of pneumatic power system.

PART-B

1. A steel rod of 20mm diameter 600 mm long is subjected to an axial pull of 40 kN. Determine the stress.
2. A steel rod 30 mm diameter 800 mm long is subjected to an axial pull of 50 kN. Determine the Stress?
3. A specimen of 40x60 mm cross section is subjected to a load of 35 kN. The specimen has 800 mm in length. Calculate the stress induced in the member.
4. A steel rod 20mm dia and 600mm long is subjected to an axial pull of 40kN. Determine the elongation of the rod if $E = 2 \times 10^5 \text{ N/mm}^2$
5. A square steel rod 20mm x 20 mm in section is to carry an axial load (compressive) of 200 kN. Calculate the shortening in a length of 60 mm. Taken $E = 2.1 \times 10^8 \text{ KN/m}^2$
6. Calculate the elongation of a steel rod of 25mm diameter and 2m in length when subjected to an axial pull of 40kN. Take young's modulus of steel is $2 \times 10^5 \text{ N/mm}^2$
7. Draw stress- strain diagram for mild steel and show the silent points
8. State (a) Hook's Law (b) Factor of Safety
9. Explain Elastic Constants.
10. Define strain energy.
11. Write short notes on
 - a . Resilience b. Proof resilience c. Modulus of resilience
12. Calculate the strain energy stored in a bar of 2000mm long, 50mm wide and 40mm thick, when it is subjected to a tensile load of 58860 N. Take $E = 1.96 \times 10^5 \text{ N/mm}^2$.
13. An axial pull of 100 kN is gradually applied on a circular steel rod 3m long and 40mm diameter. Find the strain energy that can stored in the rod. If E for rod material is $2.0 \times 10^5 \text{ N/mm}^2$.
14. A circular bar of diameter 50 mm and 3 m long is subjected to gradually applied load of 100 kN. Find the strain energy absorbed by the bar. Also find the strain energy if the same bar is turned down to a diameter of 25 mm over half of its length from one end.
Take $E = 2 \times 10^5 \text{ N/mm}^2$.
15. A compressive load of 40 kN is suddenly applied to a bar of 30 mm diameter and 4 m long. What is the work done on the bar ? What is the resilience per unit volume ? Take $E = 200 \text{ kN/mm}^2$
16. An axial pull of 50 kN is suddenly applied to steel rod of 2m long and 1000 mm^2 in cross-section. Calculate the strain energy that can be absorbed, if $E = 200 \text{ kN/mm}^2$
17. An axial pull of 50 kN is suddenly applied to steel rod of 2m long and 1000 mm^2 in cross-section. Calculate the strain energy that can be absorbed, if $E = 200 \text{ kN/mm}^2$
18. Find the instantaneous extension produced by a suddenly applied load of 20 kN, in a bar of 625 mm^2 cross-sectional area and 1500mm long. Also determine the resilience.
Take $E = 2 \times 10^5 \text{ N/mm}^2$.
19. A steel rod of 30mm diameter is 3 m long. If it is subjected to a axial pull of 80 kN suddenly applied to it, find the maximum instantaneous stress and elongation produced. Take $E = 200 \text{ kN/mm}^2$
20. A 10mm mild steel bar of length 1.6m is stressed by a weight of 150 N freely dropped through a height of 20mm before commencing to stretch the bar. Find the instantaneous stress and elongation produced in the bar. Take $E = 2 \times 10^5 \text{ N/mm}^2$.
21. A weight of 2kN is dropped on to a collar at the lower end of a vertical bar 3m long and

28mm in diameter. Calculate the height of drop if maximum instantaneous stress is not to exceed 120N/mm^2 . Take $E = 2 \times 10^5 \text{ N/mm}^2$.

22. Discuss about various types of flow of fluids?
23. Distinguish between laminar flow and turbulent flow?
24. Explain the significance of Reynolds number?
25. Define the following a) Potential Energy (b) Kinetic Energy
26. Differentiate between pressure and pressure head.
27. State and explain each term in Bernoulli's equation
28. Mention any three applications of Bernoulli equation
29. What are the assumptions made in Bernoulli equation
30. What are the limitations of Bernoulli's equation
31. What are the applications of Bernoulli's theorem? Explain any one of them
32. Explain the use of pitot tube
33. What are the different types of hydraulic coefficients explain briefly.
34. How do you rate the Intensifiers? List the various factors of rating.
35. Explain the working principle of Dead weight loaded accumulator? and state merits and demerits of it?
36. Explain the working principle of spring loaded accumulator and state merits and demerits of it?
37. Explain about Air / Gas type Accumulators?
38. Draw the circuit symbols of various types of Accumulators
39. Briefly discuss about the Industrial applications of Accumulators
40. What are the different factors considered in the selection of accumulators
41. Compare the pneumatic system with hydraulic system.
42. Define a circuit diagram
43. State the rules of drawing symbols

PART-C

1. What is linear strain?
2. Draw stress- strain diagram for mild steel and explain the salient points on it.
3. A bar 3 m long and 50 mm diameter hangs vertically and has a collar securely attached to the lower end. Find the maximum instantaneous stress induced when a
Weight of 2500 N falls through a height of 130mm on to the collar.
Weight of 25000 N falls through a height of 13mm on to the collar.
Take $E = 2 \times 10^5 \text{ N/mm}^2$
4. A bar 3 m long and 50 mm diameter hangs vertically and has a collar securely attached to the lower end. Find the maximum instantaneous stress induced when a
Weight of 2500 N falls through a height of 130mm on to the collar.
Weight of 25000 N falls through a height of 13mm on to the collar. Take $E = 2 \times 10^5 \text{ N/mm}^2$.
5. A 10 mm diameter mild steel bar of length 1.5 m is stressed by a weight of 120 N dropping freely through 20mm before commencing to stretch the bar. Find the maximum instantaneous stress and the elongation produced in the bar. Take $E = 2 \times 10^5 \text{ N/mm}^2$.
6. A steady load of 10 kN produces a stretch of 1.6 mm in a bar of 12.5 mm diameter. What stress would be produced in the bar if a load of 700 N falls freely through a height of 70 mm before commencing to stretch the bar? Take $E = 2 \times 10^5 \text{ N/mm}^2$
7. A mild steel bar of length 2m and has a diameter of 50mm, hangs vertically. A load of 20kN falls

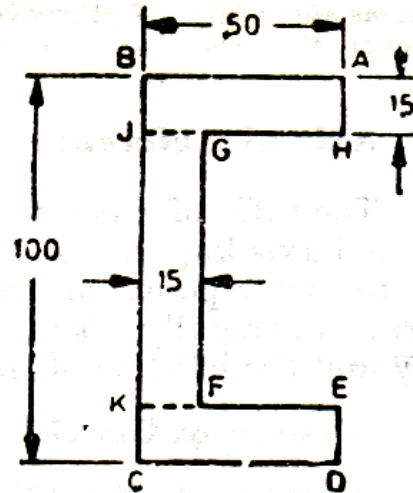
on a collar attached to the lower end. Find the maximum stress when.

(a). Height of falls is 100mm

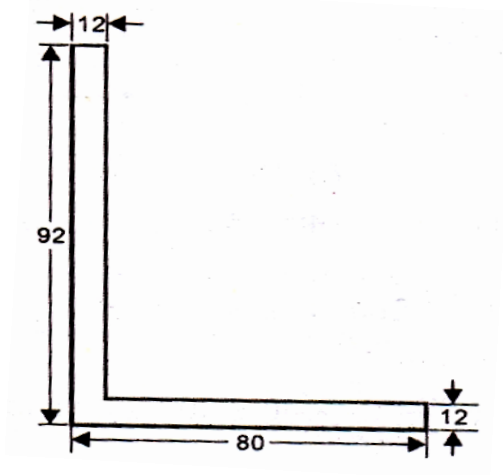
(b). Load is applied suddenly without impact

(c). The load is applied gradually. Assume $E = 2 \times 10^5 \text{ N/mm}^2$.

8. Find the centroid of a channel section given in the fig.

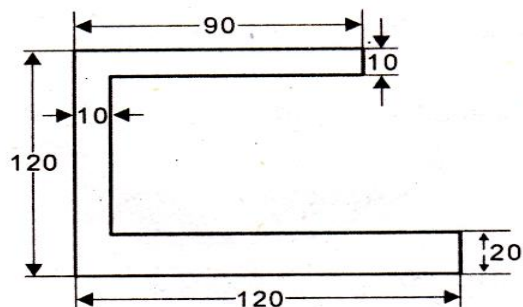


9. Find the centroid of a channel section given in the fig.

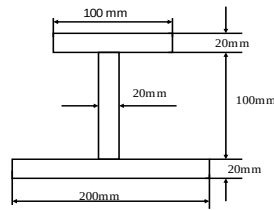


10. Find the moment of inertia of a rectangle with 20 mm wide and 30 mm deep about axis.

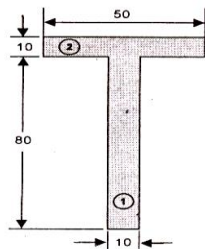
11. Find the moment of inertia of the section shown in fig. about its centroidal axis parallel to the base.



12. Find the moment of inertia as shown in fig about centroidal axis XX perpendicular to the web.



13. A bar of T- section has flange 50 mm wide and 10 mm thickness web is 80mm deep and 10 mm thick as in fig given below. find the moment of inertia of the section about centroidal axes, XX and YY



14. Determine M.I of a channel about the centroidal axes. The dimensions are in mm of following fig.

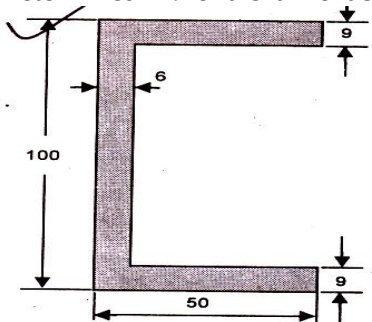


Fig. 10.24 (a)

15. List out any six types of fluid flow.
16. What are the applications of Bernoulli's Theorem ?
17. The diameter of pipe changes from 200 mm at a section 5 m above ground level to 50 mm at a section 3 m above ground level. The pressure at first section is 5 bar and water velocity is 1 m/s. Determine the pressure intensity at the second section.
18. Determine the diameter of a pipe ($f=0.02$) required to carry $50\text{ m}^3/\text{s}$ of water discharge over 2.0 km length with a head loss of 50 m
If a pipe of length 350 m and diameter 250 mm with $f=0.018$ is to be replaced by 200 mm diameter pipe with $f=0.02$ to carry the same discharge, for same loss of head, what length will have to be provided
19. explain graphically (a) Hydraulic gradient line (b) Total energy line
20. The difference in water surfaces in two reservoirs A and B is 10 m and gauge pressure of air space in reservoir A is 50 kN/m^2 . They are connected by a single pipe 250 m long 200 mm in diameter. If $f = 0.02$ calculate discharge.

21. Two pipes of diameters 20 cm and 15 cm are in parallel and connect two reservoirs. The pipes are of equal length. The difference of water level in two reservoirs is 10 m. What is the ratio of discharges due to the larger diameter pipe to that of smaller diameter pipe ? Assume f is same for both the pipes.
22. Two reservoirs are connected by a 5000 m long and 1.5 m diameter C. I. pipe with $f=0.01$. The difference in water levels in two reservoir is 25 meters. Determine the increase in discharge if the C. I. pipe is replaced with a smooth steel pipe of same size with $f = 0.005$
23. In a hydraulic power system, water is available at a head of 150 m and is to be carried through a pipe of length 500 m. Determine the minimum size of the pipe that will convey water for an output of 1000 kW at 90% efficiency. Take $f=0.006$
24. The pressure at the inlet of a pipe is 7000 kPa and the pressure drop is 700 kPa. The line is 15 km. Long. If 75 kW power is to be transmitted through this pipe line, find the diameter of the pipe and efficiency of transmission. Take $f=0.006$ $w = 9.81 \text{ k N/m}^3$
25. Find the maximum power transmitted that can be Transmitted to power station through a hydraulic pipe 3km long and 200mm diameter, when the pressure at the power station is 600 kN/m². Take $f = 0.0075$.
26. What is a venturi meter? How is it used in practice? Why it is used ?
27. Explain with help of a neat sketch the working principle of current meter.
28. Draw schematic diagram of external gear pump and explain its construction and working.
29. Draw the line diagram of a three spindle screw pump and explain its working
30. Explain the principle of operation of centrifugal pump with a sketch
31. Explain the working principle of vane motor with a neat sketch
32. Explain the use of accumulators as shock absorber in a hydraulic system with a neat circuit diagram.
33. Explain the hydraulic circuit with accumulator as a leakage compensator.

Department of Technical Education

State Board of Technical Education & Training (TS)

Course Title :	THERMAL ENGINEERING	Course Code	18PKG-403C
Semester	IV	Course Group	:Core
Teaching Scheme in Hrs(L:T:P)	30:15:0	Credits	: 3
Methodology	Lecture + Assignments	Total Contact Hours :	:45Hrs/60Pds
CIE	60 Marks	SEE	40 Marks

Pre requisites

Knowledge of basic mathematics and Applied Science

Course Outcomes

CO1	Apply basic concepts, laws and principles of thermodynamics to use and select equipments/devices/machines working on these basics
CO2	Outline various Thermodynamic process and analyze them with respect to various parameters
CO3	Identify the Limitations, applications and Comparison of Thermodynamic cycles based on different parameters
CO4	Analyze performance of ICEs by operating them and observing changes in thermodynamic properties during each stroke of ICEs (and by using diagrams.)
CO5	Operate air compressors and observe the parameters affecting the performance. Different types of heat drying methods, drying during constant rate period and falling rate period
CO6	To appraise the various form of non-conventional energy sources, their merits and demerits

MID SEM –I EXAM					
S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	
MID SEM –II EXAM					

S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

SEMESTER END EXAMINATION							
Sl No	Unit No.	Questions to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9(a)	13(a)	
2	II						
3	III		2		10(a)	14(a)	
4	IV						
5	V		3	5, 6	9(b)	13(b)	
					11(a)	15(a)	
		11(b)			15(b)		
6	VI	7,8		10(b)	14(b)		
				12(a)	16(a)		
				12(b)	16(b)		
Total Questions		8		8	8		
Legend:		Remembering (R)		1 Mark			
		Understanding (U)		3 Marks			
		Application (A)		5 Marks			

Course Content

UNIT 1 - FUNDAMENTALS AND LAWS OF THERMO-DYNAMICS Duration: 10 Periods

Define the various terms associated with the Thermo dynamic system. Define the ‘State and System’. Name the types of thermo-dynamic systems. Explain the closed, open and Isolated system with examples. List the Thermo-dynamic properties of a system. Define the various Thermo-dynamic properties. Write examples for each type of property. State the Zeroth law of thermo-dynamics. State the First law of Thermo-dynamics. Second law of thermo-dynamics. Solve problems dealing with conversion of heat into work and Vice-versa.

UNIT 2 LAWS OF PERFECT GASES

Duration: 10 Periods

Define the term 'Perfect Gas. State 'Boyle's Law, 'Charle's Law, Avogadro's Law 'Joule's Law, Regnault's Law. Write Characteristic gas equation. Write the Universal Gas equation. State relationship between characteristic gas constant, Universal gas constant (G) and molecular weight. Define 'Specific heat at constant pressure'(Cp). Specific heat at constant volume's (Cv). Solve simple problems using gas laws

UNIT3 THERMODYNAMIC PROCESSES AND ENTROPY OF GASSES Duration:10 Periods

List out the different Thermo-dynamic processes on gases. Write expression for work done in Iso-choric process. Iso-baric process. hyperbolic process, rite expression for work done in a polytrophic process. Write expression for work done in a Is-entropic process. Write the relationship between heat supplied, Increase in internal energy and work done. Sketch pressure-volume diagram for processes. Solve simple problems on processes. Explain the concept of entropy Write the equation of entropy.

UNIT 4 AIR CYCLES AND INTERNAL COMBUSTION ENGINES Duration: 10 Periods.

Define the term 'Air Standard Cycle'. Explain with a line diagram the working of Carnot cycle. State the assumptions made in Carnot cycle. Write the formula for the air standard efficiency of a Carnot cycle. Solve simple problems on Carnot cycle. Explain with help of a line diagram the working of Otto cycle. State the assumptions made in Otto cycle. Write the formula for air stand efficiency of Otto Cycle. Solve simple problems on Otto cycle, Explain with line diagrams the working of a Diesel Cycle.. Define 'Heat Engine. Classify heat engines. Give examples for each type. Summaries the advantages of internal combustion engines over external combustion engines. Explain with a line diagram the working of a four-stroke diesel engine. Explain with a line diagram the working of a two-stroke diesel engine. Explain with a neat sketch the working of a four-stroke petrol engine. Explain with a neat sketch the working of a two-stroke petrol engine. Compare two stroke engines with four stroke engines. Compare diesel engines with petrol engines.

UNIT 5 AIR COMPRESSORS AND HEAT DRYING OF FOODS. Duration: 10 Periods

Air compressor-concepts, functions, classification and applications- Single stage reciprocating air compressor- construction and working (with line diagram) Expression for work done and power required by single stage reciprocating compressor (without derivation), Simple problems heat drying of foods: Methods of heat drying, Rate of drying and Application.

UNIT 6 RENEWABLE SOURCES OF ENERGY

Duration: 10 Periods

Energy sources and their availability. Renewable energy sources. To state the different types of renewable energy sources. 1) Solar 2)Wind 3) Tidal 4)Bio-mass

1) Solar: State the principle of conversion of solar radiation into heat. Explain the function of liquid flat collector. Explain the working principle and of Solar air heater with a sketch. State the different methods of storing solar energy. Explain with the help of sketches the construction details and working principles of different types of solar water heater, solar space heater, absorption refrigerator type , solar space cooler, solar still.

2) Wind Energy: Understand the power available in the wind. State the different consideration for site selection for installing wind mill. Identify the basic components of a wind mill. Explain the construction details on the working principle of the wind mill. Explain the methods of generation electricity by wind mill

3) Tidal energy: Identify the energy available in tides and its usefulness in conversion. State the working principle of tidal power plant. State the different operation methods of utilization of tidal energy. State the site requirements for installation of tidal power plant. State the advantages of tidal power generation.

4) Bio- Gas: Understanding the meaning of bio-mass and bio-gas. State the principle of bio-gas generation. State the chemical composition and properties bio-gas. State the applications of bio-gas. List out the different types of bio-gas plants. Explain the construction details and working principle of fixed dome type and floating dome type bio-gas plants with sketches.

Reference Books

- | | | | |
|----|---------------------------------|----|-----------------------------|
| 1. | Thermal Engineering. | by | Mathur & Mehta. |
| 2. | Heat Engines | by | Pandya & Shah. |
| 3. | Heat Engines | by | R.C. Patel & Karamchandani. |
| 4. | Thermal Engineering I | by | M. Zakria Baig. |
| 5. | Applied Thermo – Dynamics | by | R.S.Khurmi. |
| 6. | Non-Conventional energy sources | | G.D Roy |

SUGGESTED LEARNING OUTCOMES

1. FUNDAMENTALS AND LAWS OF THERMO-DYNAMICS

Student will be able to know the

Identify the different types of thermodynamic systems.

Summarize the different thermodynamic properties.

List the different types of thermodynamic laws

Solve Simple problems on conversion of heat into work and vice versa.

2. LAWS OF PERFECT GASES:

Classify the different types of thermodynamic laws

Write characteristic gas equation

Name Specific heat at constant pressure, specific heat at constant volume for a gas.

Write an expression connecting the two specific heats with the characteristic gas constant.

Solve Simple problems on gas equation.

3 THERMODYNAMIC PROCESSES AND ENTROPY OF GASSES

Outline the various thermodynamic processes on gasses,

Analyze the different thermodynamic processes on the P-V and T- ϕ diagrams.

Write the formula for work done during the different thermodynamic processes.

Justify the work done in throttling process is zero

Calculation of change of internal energy enthalpy

Calculation of heat supplied or rejected during the above processes.

4 AIR CYCLES AND INTERNAL COMBUSTION ENGINES

Meaning of air standard cycle-its use

Brief description of Carnot, Otto, Diesel cycle with line sketches and P.V diagrams, Assumptions – efficiency

Write functions of Internal combustion and external combustion engines – Examples

Summaries advantages of I.C. Engines over external combustion engines.

Classify I.C. Engines.

Brief explanation on the principle of working of four stroke diesel, petrol engine and two stroke diesel, Petrol engine.

Brief explanation on the principle of working of four stroke and two stroke petrol engines.

Compare two stroke engines and four- stroke engines.

Compare diesel engines and petrol engines.

5 AIR COMPRESSORS AND HEAT DRYING OF FOODS.

Classify Air compressors.

Write the functions and uses of compresses air

Construct Single stage reciprocating air compressor and working (with line diagram) using P.V. Diagram

Concept of heat drying.

Write methods of heat drying

Draw Drying curves

Know the critical moisture content

Analyze Drying during constant rate period and falling rate period.

Write Applications of heat drying.

6 RENEWABLE SOURCES OF ENERGY

Understand the Renewable Energy sources and their availability

Classify the different types of renewable energy sources.

Write the different methods of storing solar energy.

List the different types of solar applications and explain.

Construction details and working principles of wind mill.

Know the Tidal Energy and Recommend the place used for tidal power plant establishment.

Summarize the advantages and limitations of tidal power generation.

Utilize the Bio Energy in the domestic and industrial purpose

List out the different types of bio-gas plants.

Suggested Student Activities

1. Identify and list real situations which works on:
a: Zeroth law. b: First law of thermodynamics. c: Second law of thermodynamics.
2. Identify different Thermodynamic process in real situations.
3. Prepare charts of diesel, dual and gasoline cycles. Tabulate main points of differences between them.
4. Write the specifications of I.C.Engine of any two wheelers. Also Construct & explain cycle on which that I.C.Engine works.
5. Collect/ download product catalogues with specification of various types of Air compressors used in industry

6. Prepare a of monthly energy consumption of your institute and find the ways how it can be conserved
7. Conduct an energy audit of your institute; suggest the ways how the conventional energy resources utilization can be minimized. Suggest the areas ,where the non-conventional energy may be used
- 8 Identify the solar intensity and wind speed in your institute locality and calculate the intensity of Solar/Wind Power can be generated.
9. Visit to web site of ministry of renewable energy ,Government of India: <http://mnre.gov.in/> make a Study on 'Developmental Impact and Sustainable Governance aspects of Renewable Energy Projects'
10. Visit solar power plant /wind power plant available in your locality/ nearer to your institute and understand different elements, working, and note the power generation by these plants.
11. Visit the near Industries of food processed and how they are export in thermal and freeze conditions.
12. Quiz
13. Group discussion
14. Surprise test

Suggested e-Resources:

1. <http://nptel.ac.in>
2. www.packagingclinic.com
3. www.iip.in.com
4. <https://pcrri.org>
5. <http://www.nptel.iitm.ac.in/video.php?subjectId=112105123> (IIT-B Video lectures)
6. <http://www.thermofluids.net/>
7. <http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv301-Page1.htm>
8. <http://www.grc.nasa.gov/WWW/k-12/airplane/thermo.html>
9. <http://www.youtube.com/watch?v=Xb05CaG7TsQ>
10. <http://www.youtube.com/watch?v=aAfBSJObd6Y>
11. <http://www.youtube.com/watch?v=DHUwFuHuCdW>
12. <http://www.youtube.com/watch?v=kJlmRT4E6R0>
13. <http://www.youtube.com/watch?v=GKqG6n6nAmg>

CO-PO Mapping Matrix

Course Outcome		CL	Linked PO	Teaching periods
CO1	Apply basic concepts, laws and principles of thermodynamics to use and select equipments/devices/machines working on these basics	R/U/A	1,2,9	8
CO2	Outline various Thermodynamic process and analyze them with respect to various parameters	R/U/A	1,2,9,10	12
CO3	Identify the Limitations, applications and Comparison of Thermodynamic cycles based on different parameters	R/U/A	1,2,6,9	8
CO4	Analyze performance of ICEs by operating them and observing changes in thermodynamic properties during each stroke of ICEs (and by using diagrams.)	R/U	1,2	12
CO5	Operate air compressors and observe the parameters affecting the performance. Different types of heat drying methods, drying during constant rate period and falling rate period	R/U/A	1,2,5	8
CO6	To appraise the various form of non-conventional energy sources, their merits and demerits	R/U/A	1,2,3,8,9,10	12
				60

MODEL QUESTION PAPER
BOARD DIPLOMA MID-SEMESTER EXAMINATIONS (C-18)
D.PKGT – IV - SEMESTER EXAMINATION
18PKG-403C – THERMAL ENGINEERING

TIME: 1 HOUR

MAXIMUM MARKS: 20

PART –A

MARKS: 4 X 1 = 4

NOTE: Answer ALL questions. Each question carries ONE marks.

1. State first law of thermodynamics?
2. Define system
3. Write Zeroth law of thermodynamic?
4. Define boyles law

PART –B

MARKS:2 X3 = 6

NOTE: Answer ALL questions. Each question carries THREE marks.

5.(a). State thermodynamics Second law ?

(OR)

5 (b) What is Adiabatic process ? Write Adiabatic index

6 (a). A closed system undergoes a process change in which 2 KJ of heat energy is supplied to system. Find the change in internal energy under the following conditions.

- a) 0.5 kJ of work is done on the system.
- b) 0.75 kJ of work is done by the system.

(OR)

6.(b). In constant pressure process, the change in enthalpy is 20KJ and work done is 15 KJ, what is the heat transfer ?

PART –C

MARKS:2 X5 =10

NOTE: Answer ALL questions. Each question carries FIVE marks.

7(a). Draw P-V diagrams for

- isochoric process
- isobaric process
- isothermal process
- Isentropic process

(OR)

7(b). A System executes a cyclic process during which there are four transfers, namely, $Q_1 = 20$ kJ, $Q_2 = -4$ kJ, $Q_3 = 15$ kJ, $Q_4 = 4$ kJ. At four points work is done three of which are $W_1 = 306$ kJ, $W_2 = -2.6$ kJ and $W_3 = 4$ kJ. What is the fourth quantity ? State whether work is done by the system or on the system.

8(a) A closed vessel contains 2 kg of carbon dioxide at temperature 20° C and pressure 0.7 bar. Heat is supplied to the vessel till the gas acquires a pressure of 1.4 bar. Calculate a) Final temperature b) Work done on or by the gas c) Heat added d) Change internal energy
Take specific heat of the gas at constant volume as 0.657 kJ/kg K

(OR)

8(b). A gas, having initial pressure, volume and temperature as 275 kN/m^2 , 0.09 m^3 and 185°C respectively, is compressed at constant pressure until its temperature is 15°C . Calculate the amount of heat transferred and work done during the process. Take $R = 290 \text{ kJ/kg K}$ and $C_p = 1.005 \text{ kJ/kg K}$.

MODEL QUESTION PAPER
BOARD DIPLOMA SEMESTER END EXAMINATIONS (C-18)
D.PKGT – IV - SEMESTER EXAMINATION
18PKG-403C – THERMAL ENGINEERING

TIME: TWO HOURS

MAXIMUM MARKS: 40

PART –A

MARKS: 8 X1 = 8

NOTE: Answer ALL questions. Each question carries ONE marks.

1. Classify a thermodynamic system
2. Write any two limitations of Carnot cycle ?
3. What is an I.C Engine – Define?
4. Write any two uses of compressed air?
5. Define the term solar radiation ?
6. Define the Wind energy
7. What are the different types of dryers
8. What is biogas?

PART –B

MARKS:4 X3 =12

Answer ALL questions. Each question carries THREE marks.

9 (a).A closed system undergoes a process change in which 2 KJ of heat energy is supplied to system. Find the change in internal energy under the following conditions.

- a) 0.5 kJ of work is done on the system.
- b) 0.75 kJ of work is done by the system.

(OR)

9.(b). A Single stage reciprocating air compressor is required to compress 60m^3 of air from 1bar abs to 8 bar abs. find the work to be supplied if law of compression is $PV^{1.25} = \text{constant}$

10(a).Draw the P-V and T- ϕ diagrams for Otto cycle and explain the salient points ?

(OR)

10.(b).Describe the Working of Natural Circulation Water Heater with a sketch.

11(a).Explain the working principle of diesel cycle with the P-V and T- ϕ diagrams ?

(OR)

11(b).Explain the working of a 4-stroke C.I engine with a neat sketch?

12(a).Explain the Working of Box Type Solar Cooker with a sketch.

(OR)

12(b).What are the advantages and disadvantages of wind energy ?

PART –C

MARKS:4 X5 =20

Answer ALL questions. Each question carries FIVE marks.

13 (a).In constant pressure process, the change in enthalpy is 20KJ and work done is 15 KJ, what is the heat transfer ?

(OR)

13 .(b).Draw a P-V diagram for an ideal reciprocating single stage air compressor without clearance

14(a).A certain gas occupies a space of 0.3 m^3 at a pressure of 2 bar and a temperature of 77°C . It is heated at a constant volume until the pressure is 7 bar. Determine a)Temperature at the end of process.

b) Mass of the gas. c) Change in internal energy. Assume $C_p = 1.005 \text{ KJ/Kg K}$, $C_v = 0.718 \text{ KJ/Kg K}$.

(OR)

14 .(b).What do you mean by adiabatic drying

15(a).Find the air standard efficiency of engine working on otto cycle for the compression ratios 6, 7, and 8. (take $\gamma = 1.4$).

(OR)

15(b).Analyze the stages in drying for a solution being dried in a spray dryer.

16 (a). What are the factors to be considered for selection of site for tidal power plant

(OR)

16 .(b).Explain about the construction and working principle of floating type digester with neat sketch

18PKG-403C – THERMAL ENGINEERING
QUESTION BANK

PART –A

1. Define system and classify a thermodynamic system with examples.
2. Define state, property of thermodynamic system?
3. What is intensive property of a system?
4. What is extensive property of a system?
5. Define the terms pressure and volume
6. State first law of thermodynamics?
7. State thermodynamics Second law ?
8. State Boyle's law and Charles's law.
9. Represent the constant volume process on p-v diagram.
10. Represent the constant pressure process on p-v diagram
11. Represent the isothermal process on p-v diagram for expansion and compression
12. Define entropy related to thermodynamic system.
13. State Clausius' theorem.
14. Describe the concept of entropy
15. What is cycle?
16. What are the conditions for reversible cycle?
17. What is the application of Carnot cycle ?
18. Name the processes involved in Otto cycle ?
19. State the assumptions made in the analysis of Otto cycle ?
20. Draw the P-V and T- ϕ diagrams for Otto cycle ?
21. What is an I.C Engine – Define?
22. Draw a P-V diagram for an ideal reciprocating single stage air compressor without clearance
23. What do you mean by adiabatic drying
24. What are the renewable energy sources?
25. State the need of using renewable energy sources
26. State the advantages of Solar air heater.
27. State the applications of Solar air heater.
28. List the different Solar Appliances
29. Define the terms a) Wind b) Wind energy.
30. What are the causes of wind ?
31. Define wind mill ?
32. Give the classification of wind mill
33. Write about bio mass, bio energy and bio gas
34. Write about chemical composition, properties and applications of bio gas
35. Explain briefly the uses of biogas
36. Explain about tidal range with a sinusoidal curve.

PART –B

1. Write the statement of Zeroth law of thermodynamics and explain with suitable examples?
2. What do you mean by thermal equilibrium, explain?

3. A System executes a cyclic process during which there are four transfers, namely, $Q_1 = 20 \text{ kJ}$, $Q_2 = -4 \text{ kJ}$, $Q_3 = 15 \text{ kJ}$, $Q_4 = 4 \text{ kJ}$. At four points work is done three of which are $W_1 = 306 \text{ kJ}$, $W_2 = -2.6 \text{ kJ}$ and $W_3 = 4 \text{ kJ}$. What is the fourth quantity? State whether work is done by the system or on the system.
4. A closed system undergoes a process change in which 2 kJ of heat energy is supplied to system. Find the change in internal energy under the following conditions.
 - (a) 0.5 kJ of work is done on the system.
 - (b) 0.75 kJ of work is done by the system.
5. A tank containing air is stirred by a paddle wheel. The work input to the tank is 1000 kJ , and heat transferred from the tank is 400 kJ . Calculate the change of internal energy.
6. A gas when original pressure and volume were 400 kN/m^2 and 0.15 m^3 is expanded until its new pressure is 75 kN/m^2 while its temperature remains constant. What is its new volume?
7. The value of adiabatic index of a certain gas is 1.41 and its specific heat at constant volume is 0.65 kJ/kg K . Determine the gas constant.
8. In a constant pressure process, the change in enthalpy is 20 kJ and work done is 15 kJ . What is the heat transfer?
9. During a constant pressure process at 10 kN/m^2 , the volume changes from 1 m^3 to 5 m^3 . What is the work done?
10. 0.1 m^3 of air at a pressure of 1.5 bar is expanded isothermally to 0.5 m^3 . Calculate the final pressure of the gas and heat supplied during the process.
11. Draw P-V diagrams for
 - isochoric process
 - isobaric process
 - isothermal process
 - Isentropic process
12. What are the assumptions made in Carnot cycle?
13. What are the limitations of Carnot cycle?
14. An engine produces 10 kJ as work while 80 kJ enters the engine cycle as heat. Determine the energy rejected and the thermal efficiency of cycle.
15. A Carnot cycle operates between 900°C and 100°C . Determine the efficiency of cycle, the heat rejected and the useful work output, if 100 kJ enters the cycle as heat.
16. A Carnot cycle operates between the source temperature 535°C and sink temperature of 35°C . If the engine is to have an output of 40 kW , determine the heat supplied, efficiency of engine, and heat rejected.
17. Find the efficiency of an engine working on the Carnot cycle if heat is taken at 540°C and rejected at 45°C .
18. Explain the working principle of Otto cycle with P-V and T-s diagrams?
19. Write the formula for the air standard efficiency of Otto cycle and explain each term in it.
20. Draw the P-V and T- ϕ diagrams for diesel cycle and explain the salient points?
21. Explain the working principle of diesel cycle with the P-V and T- ϕ diagrams?
22. Write the thermal efficiency equation of diesel cycle and explain each term in it.
23. Give the comparison between Carnot cycle and Otto cycle?
24. How I.C engines are classified basing on cycle of operation?
25. What are the advantages of I.C Engines over E.C Engines?
26. Draw the line diagram of general arrangement of compressor.
27. What are the uses of compressed air?
28. How do you classify air compressors?
29. Explain the working principle of a single stage reciprocating air-compressor with a neat sketch.
30. What are the different types of dryers?

31. How will the drying rate curve change if the wet solid is dried in a fluidized bed dryer instead of a tray dryer?
32. Write influenced by the drying process in a tray dryer.
33. How drying foods preserve
34. Explain the working principle of Solar air heater.
35. What is Solar Collector ? List the different types of Solar Collectors.
36. Describe the Working of Cylindrical Parabolic Collector.
37. List the different Methods of Storing Solar Energy.
38. Explain the Working of Solar Pond with a Sketch. State the Applications
39. What are the Applications of Solar Water Heaters
40. State the Advantages and Dis-Advantages of Solar Cooker
41. Explain Working of Solar Still with a sketch.
42. Describe the Working of Solar Dryer with neat figure.
43. Explain the Working of Box Type Solar Cooker with a sketch.
44. What are the advantages and disadvantages of wind energy ?
45. What are the factors to be considered in selection of a site for wind energy conversion system ?
46. What are the components of wind mill and explain them in brief ?
47. What is tide? And Explain about principle of tidal power generation
48. What are the main components of tidal power plant.
49. What are the factors to be considered for selection of site for tidal power plant
50. List out four advantages and four limitations of tidal power

PART –C

1. Air at initial pressure of 1.3 bar has specific volume of $0.9 \text{ m}^3/\text{kg}$ and temperature 135°C . Find the gas constant.
2. An ideal gas has a mass 1.5kg and occupies 2.5 m^3 while at a temperature of 27° and pressure of 200 kN/m^2 . Determine the gas constant
3. A closed vessel contains 2 kg of carbon dioxide at temperature 20°C and pressure 0.7 bar. Heat is supplied to the vessel till the gas acquires a pressure of 1.4 bar. Calculate a) Final temperature b) Work done on or by the gas c) Heat added d) Change internal energy
Take specific heat of the gas at constant volume as 0.657 kJ/kg K
4. A gas, having initial pressure, volume and temperature as 275 kN/m^2 , 0.09 m^3 and 185°C respectively, is compressed at constant pressure until its temperature is 15°C . Calculate the amount of heat transferred and work done during the process. Take $R = 290 \text{ kJ/kg K}$ and $C_p = 1.005 \text{ kJ/kg K}$.
5. One kg of ideal gas is heated from 18.3°C to 93.4°C . assuming $R = 0.264 \text{ kJ/kg K}$ and $\gamma = 1.18$ for the gas, find 1) specific heat 2) change internal energy.
6. For certain ideal gas $R = 0.278 \text{ kJ/kg K}$ and $\gamma = 1.25$ determine C_p , C_v
7. One kg of air is heated in a closed rigid vessel such that its temperature changes from 27°C to 427°C . Find the heat transferred and change in internal energy. Assume $R = 0.287 \text{ kJ/Kg K}$ and $C_p = 1.005 \text{ kJ/Kg K}$.
8. A certain gas occupies a space of 0.3 m^3 at a pressure of 2 bar and a temperature of 77°C . It is heated at a constant volume until the pressure is 7 bar. Determine a) Temperature at the end of process. b) Mass of the gas. c) Change in internal energy.
Assume $C_p = 1.005 \text{ kJ/Kg K}$, $C_v = 0.718 \text{ kJ/Kg K}$.
9. 0.4 kg of air at a pressure of 1 bar and 20°C is compressed isothermally until its volume is 0.08 m^3 . Determine the work done on the air during compression. Also find the final pressure of the gas. Take $R = 0.287 \text{ kJ/kg K}$

10. A Carnot engine is operating between two reservoirs at temperature 750°C and 35°C . If the engine receives 220 KJ of heat from the source, Calculate the heat rejected, efficiency and work done.
11. Find the air standard efficiency of engine working on Otto cycle for the compression ratios 6, 7, and 8. (take $\gamma = 1.4$).
12. Find the increase in the percentage of air standard efficiency of Otto cycle if the compression ratio increased from 6 to 7. (take $\gamma = 1.4$).
13. Find the air standard efficiency of engine working on Otto cycle if the compression ratio is 5. Also find the percentage increase in ASE if the compression ratio is increased to 7. Take $\gamma = 1.4$
14. Compare Carnot, Otto and Diesel cycles with each other?
15. Explain the working of a 4-stroke C.I engine with a neat sketch?
16. Explain the working of a 2-stroke C.I engine with a neat sketch?
17. With a neat sketch explain the working of a four stroke S.I engine?
18. Explain the working of a two stroke petrol engine with a neat sketch
19. Write the comparison of 4-stroke engines and two stroke engines.
20. Compare S.I engines and C.I engines.
21. A Single stage reciprocating air compressor is required to compress 60m^3 of air from 1 bar abs to 8 bar abs. find the work to be supplied if law of compression is $PV^{1.25} = \text{constant}$
22. Find the amount of work required to compress and discharge 1m^3 of air at 15°C and 1 bar to 7 bar abs, when the compression is isothermal. Take $R = 0.29 \text{ KJ/Kg K}$
23. A single stage air compressor has an effective swept volume of $5\text{m}^3/\text{min}$ and delivers to a receiver at a pressure of 6.5 bar. The index of compression $n=1.25$, and the temperature at the end of suction stroke is 35°C and pressure is 1.03 bar.
24. Explain constant rate period, drying)
25. Explain constant Falling rate period drying)
26. Analyze the stages in drying for a solution being dried in a spray dryer.
27. How the distribution of a water-soluble drug in a wet granulation
28. What is the optimum temperature for drying . Explain briefly
29. Write different types of dehydraters.
30. Explain Working of Solar Flat Plate Collector.
31. Describe the Working of Natural Circulation Water Heater with a sketch.
32. Explain Working of Forced Circulation Water Heater.
33. Explain the Working of Solar Vapour Absorption Refrigeration system.
34. Explain the working principle and constructional details of Horizontal Axis Wind Mill.
35. Explain about the vertical axis wind mill with a neat sketch.
36. State the differences between HAWM and VAWM.
37. Explain about the construction and working principle of floating type digester with neat sketch
38. Explain the construction details and working principle of fixed dome type bio-gas plant with neat sketch.
39. Explain briefly the working of tidal power plant with neat sketch.

Department of Technical Education
State Board of Technical Education & Training (TS)

Course Title :	Packaging Materials and Test Procedures	Course Code	18PKG-404C
Semester	IV	Course Group	Core
Teaching Scheme in Hrs(L:T:P)	30:15:0	Credits	3
Methodology	Lecture + Assignments	Total Contact Hours :	45/60Pds
CIE	60 Marks	SEE	40 Marks

Pre requisites

This course requires the basic knowledge of Basics of packaging technology and Elements of packaging Technology along with conventional packaging materials.

On completion of the course, the student will be able to :

Course Outcomes

CO1	Identify the different Lamination Processes.
CO2	Select the packaging materials for a given product
CO3	Evaluate the testing methods for Transport packages
CO4	Test and Categorization of plastics.
CO5	List the Degradation types of packaging materials
CO6	How can you classify the Plastics used in Packaging
CO7	Discus various types of Plastics and their Properties to select compatibility and suitability for a given Product.

MID SEM –I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM –II EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

SEMESTER END EXAMINATION

Sl No	Unit No.	Questions to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9(a)	13(a)	
2	II						
3	III		2		10(a)	14(a)	
4	IV						
5	V		3	5, 6	9(b)	13(b)	
					11(a)	15(a)	
				11(b)	15(b)		
6	VI		7,8	10(b)	14(b)		
				12(a)	16(a)		
				12(b)	16(b)		
Total Questions		8		8	8		
Legend:		Remembering (R)		1 Mark			
		Understanding (U)		3 Marks			
		Application (A)		5 Marks			

Course Content

UNIT 1 - LAMINATIONS

Duration: 10 Periods(L:6-T:4)

Laminations – wet laminations, dry laminations, hot melt lamination, heat lamination, extrusion lamination, combinations methods, Design of lamination properties, uses & applications.

UNIT 2 - TESTING PROCEDURE FOR PACKAGING MATERIALS AND PACKED PRODUCTS

Duration: 10 Periods(L:6-T:4)

Packaging materials, physical – physio-chemical strength, light, insects and mould resistance.

Packed products: packaging compatibility studies

UNIT 3 - TESTING METHODS FOR EVALUATION OF TRANSPORT PACKAGES

Duration: 10 Periods(L:6.-T:4)

Mechanical tests: drop test- vibration test - compression test - impact test - rolling test.

Climate test: rain test - sound and dust tests - salt spray test - fungus resistance tests.

UNIT 4 - TESTING AND IDENTIFICATION OF PLASTIC FILMS

Duration: 10 Periods(L:6-T:4)

Different testing for plastic films - Identification of plastics with mechanical and chemicals tests.

UNIT 5 - **BIO-DEGRADABLE MATERIALS**

Duration: 10 Periods(L:6-T:4)

Bio-degradation and Packaging - Bio-degradable materials - Bio-degradable testing methods - Photo-degradable plastics - Future trends

UNIT 6 - **PLASTICS**

Duration: 10 Periods(L:6-T:4)

Introduction, raw materials, natural, synthetic polymers, thermo sets, thermo plastics **Poly-olefins:** Low density polyethylene, High density polyethylene, High molecular high density polyethylene, Polypropylene in packaging, Bi-axially oriented polypropylenes, Expanded Polyethylene - **Polyvinyls:** Polyvinyl chloride, Polyvinylidene chloride –**Conversion:** Multilayer flexible composites, Multilayer composites, Multilayer composites – manufacturing Coating & lamination, PVDC coating of plastics films, Synthetic adhesives, Stretched bottles of PVC & PET Thermoformed containers, Stand up pouches, Plastics corrugated board. Plastics in bulk packaging, - Applications: Plastics in food packaging, pharmaceuticals packaging, packaging of ghee, packaging of marine products, packaging of fertilizers.

Reference Books

1. Packaging – An Introduction. - Stanley Sacharow
2. Fundamentals of Packaging - F.A. Paine
3. The Packaging Users Hand Book - F.A. Paine
4. Hand Book of Package Engineering - J.F. Hanion

SUGGESTED LEARNING OUTCOMES

1.0 LAMINATIONS

Categorization of laminations and applications.

2.0 TESTING PROCEDURES FOR PACKAGING MATERIALS AND PACKED PRODUCTS

Analysis of Physical Tests and Chemical tests

3.0 TESTING METHODS FOR EVALUATION OF TRANSPORT PACKAGES

Evaluation of Functional requirements for Transit packaging and analysis of Mechanical tests and Climatic tests

4.0 TESTING AND IDENTIFICATION OF PLASTIC FILMS

Examine the plastic films and Identification of plastic films

5.0 BIO-DEGRADABLE MATERIALS

Define degradation and analyze the Degradability of Common Packaging materials. Adapt different degradation techniques for packaging materials and their test methods.

6.0 PLASTICS

Define Plastics and Identification of raw materials for it. Categorization of plastics and analyze their properties for suitable to packaging different products. Analysis of plastic applications in packaging.

Suggested Student Activities

1. Each student should visit library to refer to manual/Journals of Packaging related to packaging materials and components.
2. Each student should visit the Lab to know the materials used for packaging.
3. Each student will do the report on Types Different Packages available in the market
4. Prepare any one type of package carrying different food products in market.
5. Identify and prepare a list of materials used in the Different types of packaging applications.
6. Quiz and Group discussion
7. Surprise test

Suggested e-Resources:

1. <http://nptel.ac.in>
2. www.packagingclinic.com
3. www.iip.in.com
4. <https://pcrri.org>

CO-PO Mapping Matrix

Course Outcome		CL	Linked PO	Teaching periods
CO1	Identify the different Lamination Processes.	R/U/A	1,2,9	06
CO2	Select the packaging materials for a given product	R/U/A	1,2,9,10	12
CO3	Evaluate the testing methods for Transport packages	R/U/A	1,2,6,9	12
CO4	Test and Categorization of plastics.	R/U	1,2	10
CO5	List the Degradation types of packaging materials	R/U/A	1,2,5	10
CO6	How can you classify the Plastics used in Packaging	R/U/A	1,2,3,8,9,10	02
CO7	Discuss various types of Plastics and their Properties to select compatibility and suitability for a given Product.	R/U/A	1,2,3,8,9,10	08
				60

MODEL QUESTION PAPER
BOARD DIPLOMA MID-SEMESTER EXAMINATIONS (C-18)
D.PKGT –IV - SEMESTER EXAMINATION
18PKG-404C - PACKAGING MATERIALS AND TEST PROCEDURES

TIME: 1 HOUR

MAXIMUM MARKS: 20

PART –A

MARKS: 4 X 1 = 4

NOTE: Answer ALL questions. Each question carries ONE marks.

1. What are the different types of Laminations?
2. What is “WVTR”?
3. What are the different testing methods of blow-moulded containers ?
4. What are the general test methods of plastic packages

PART –B

MARKS: 2 X 3 = 6

NOTE: Answer ALL questions. Each question carries THREE marks.

- 5 (a). Write about lamination and give examples ?
(OR)
- 5 (b). What are the different Mechanical tests for package materials ?
- 6 (a). Write down the advantages of lamination.
(OR)
- 6 (b). What are the physical tests for package materials, Explain any one ?

PART –C

MARKS: 2 X 5 = 10

NOTE: Answer ALL questions. Each question carries FIVE marks.

- 7a) Explain about “wet lamination”.
(OR)
- 7(b). What is “COBB”- test ? write the procedure.
- 8(a). Explain about “Bursting strength” Test.
(OR)
- 8(b). Explain about climatic test

MODEL QUESTION PAPER
BOARD DIPLOMA SEMESTER END EXAMINATIONS (C-18)
D.PKGT – IV - SEMESTER EXAMINATION

18PKG-404C - PACKAGING MATERIALS AND TEST PROCEDURES

TIME: TWO HOURS

MAXIMUM MARKS: 40

PART –A

MARKS: 8 X1 = 8

NOTE: Answer ALL questions. Each question carries ONE marks.

1. What are the different types of Laminations?
2. Write down the advantages of lamination.
3. What are the test methods of paper ?
4. Write down the different water soluble plastics
5. What is “Cellophane”?
6. What are the different types of polymers ?
7. What are the general test methods of packages ?
8. What are the different type of Polypropylene ?

PART –B

MARKS:4 X3 =12

Answer ALL questions. Each question carries THREE marks.

- 9(a).Define lamination and give examples ?
(OR)
- 9(b).What are the physical tests for package materials, Explain any one ?
- 10(a).Write down different hazards of transport .
(OR)
- 10(b).Write down the different types of Biodegradable plastics.
- 11(a).Define “MFI”, How properties are effected by density in “LDPE” ?
(OR)
- 11(b).Write down the different types of Biodegradable plastics.
- 12(a).Write down about Degradation of paper.
(OR)
- 12(b).What are the physical tests for package materials, Explain any one ?

PART –C

MARKS:4 X5 =20

Answer ALL questions. Each question carries FIVE marks.

- 13(a).Explain about “Dry lamination “.
(OR)
- 13(b).Explain about climatic test.
- 14(a).What is heating test ? and explain about nature of odour in this test
(OR)
- 14(b).Explain about “Bursting strength” Test.
- 15(a).What is “COBB”- test ? write the procedure.
(OR)
- 15(b).Explain about Photo-degradation – promoting additives.
- 16(a).What are the properties and applications of “LDPE” ?
(OR)
- 16(b).What are the properties and applications of “PVC” ?

QUESTION BANK
18PKG-404C - PACKAGING MATERIALS AND TEST PROCEDURES

PART –A

1. What are the different types of Laminations ?
2. Define lamination and give examples ?
3. What is “WVTR”, explain ?
4. What are the different testing methods of blow-moulded containers ?
5. What are the general test methods of plastic packages ?
6. What is “Edible Packaging” give two examples ?
7. Write down the different water soluble plastics
8. What is “Cellophane”?
9. What are the different types of polymers ?
10. What are the general test methods of plastic packages ?
11. What are the different type of Polypropylene ?

PART –B

11. What are the applications of lamination ?
12. Write down the advantages of lamination.
13. What are the physical tests for package materials, Explain any one ?
14. What are the different Mechanical tests for package materials ?
15. Write down different hazards of transport .
16. Write down the different types of Biodegradable plastics.
17. Explain about “Bursting strength” Test.
18. Define “MFI”, How properties are effected by density in “LDPE” ?
19. What are the different phases of Polymerisation ?
20. Write down the “Degradability” of ten packaging materials.
21. Write down about Degradation of paper.

PART –C

22. Explain about “wet lamination”.
23. Explain about “Dry lamination “.
24. What is “COBB”- test ? write the procedure.
25. Explain about “Drop test”.
26. Explain about “Bursting strength” Test.
27. Explain about climatic test.
28. What is heating test ? and explain about nature of odour in this test
29. What is “Burning Test” and explain about colour, odour in this test?
30. What is “PHBV” and explain it’s properties ?
31. Explain about Photo-degradation – promoting additives.
32. Write down about Degradation of paper.
33. What are the properties and applications of “LDPE” ?
34. What are the properties and applications of “BOPP” ?
35. What are the properties and applications of “HDPE” ?
36. What are the properties and applications of “PVC” ?

Department of Technical Education
State Board of Technical Education & Training (TS)

Course Title :	Package Design Engineering & Printing	Course Code	18PKG-405C
Semester	IV	Course Group	Core
Teaching Scheme in Hrs(L:T:P)	30:15:0	Credits	3
Methodology	Lecture + Assignments	Total Contact Hours :	45/60Pds
CIE	60 Marks	SEE	40 Marks

Pre requisites

18PKG-301F, 18PKG-303C and 18PKG-304C

On completion of the course, the student will be able to :

Course Outcomes

CO1	Analyse the hazards encountered in distribution and determine protection requirement
CO2	Estimate the vibration, shock encountered by a product in distribution on the basis of principles of distribution dynamics
CO3	Ability to design a package & a packaging system for a particular application.
CO4	Ability to prove worth of designed package & packaging system.
CO5	Ability to select proper packaging material for a particular graphics requirement.
CO6	Ability to select printing process for a particular requirement.

MID SEM –I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM –II EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

SEMESTER END EXAMINATION							
Sl No	Unit No.	Questions to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9(a)	13(a)	
2	II						
3	III		2		10(a)	14(a)	
4	IV						
5	V		3	5, 6	9(b)	13(b)	
					11(a)	15(a)	
					11(b)	15(b)	
6	VI			7,8	10(b)	14(b)	
		12(a)			16(a)		
		12(b)			16(b)		
Total Questions		8		8	8		
Legend:		Remembering (R)		1 Mark			
		Understanding (U)		3 Marks			
		Application (A)		5 Marks			

Course Content

UNIT 1 - INTRODUCTION OF PACKAGE DESIGN, OPTIMUM CUSHIONING

SELECTIONS

Duration: 10 Periods(L:6-T:4)

Introduction, objectives of package design, definition, function, scope of packaging field. Package design factors - discuss the various factors to be considered for design of the package. The role of designer in product cost and the company's profit - Design conditions, safety factors, impact design criterion, horizontal impact, vertical cushioning displacement, design cushioning theory, application of force deformation curves, application of load curves, spring contents - Area under load deflection curve, load energy curve, force energy – load curve, shock force static weight curve, interpretation of thickness optimum, increasing energy absorption of increase efficiency, cushioning factors, comparison of cushioning efficiency, cushioning reliability, displacement included in calculation using to determine effect of varying drop conditions, economics of optimum cushioning - Use of tension spring mounting systems, schematic diagram of tension spring package, design of tension spring package - Full suspension package, non-linear energy absorption load factors for vertical drops, design considerations.

UNIT 2 - RUBBER SHEAR MOUNTS AND VIBRATION, CONTAINERS, GRAPHIC TOOLS DESIGN

Duration: 10 Periods(L:6-T:4)

Use of rubber shear mounts - Definition & statement of terms, physical concept of flexible mounting systems, natural frequency, design considerations - limitations of energy curve - Materials, specifications, plywood containers, typical ply wood container analysis, handling loads, stacking loads - Bottle design, special requirement for bottle performance, manufacturing and filling, specification. Environmental concerns - Glass container design - Container shape and dimensions - Marketing and sales factors. Color, shape, labels, decoration, surface conditions. Scope of packaging field, role of shipping container - Two major roles of contemporary package design – clear & legible communication, legal aspects of packaging graphics – designers approach to clear & legible communications. Packaged product information – government & consumer issues.

UNIT 3 - TYPE PRODUCTION & CAMERA WORK Duration: 10 Periods(L:6-T:4)

Hand composition and make-up the monotype machine – type writer composition – Photocomposing machines – Editing systems – film and paper make up, Cameras – Screens – Process color work – Electronic color separation, Packaging graphics marketing communication roles – the reach & frequency of packaging graphics, marketing audience and communication factors of graphics, design, consumer research specific to purchasing graphics, proper planning and execution of graphics programmes, the future - Topography and copy, color, design forms, UPC symbolic and other penal copy.

UNIT 4 - LETTER PRESS - OFFSET LITHOGRAPHIC PRINTING

Duration: 10 Periods(L:6-T:4)

Process - Composition - Imposition - Printing - Photopolymer Plates - Variants on the letterpress - Creating artwork - Current initiatives - Modern offset printing - Process variations - Plates - Sheet-fed offset - Web-fed offset - Sheet-fed vs. web-fed - Inks - In industry - Printing surfaces – make-ready-Printing machines letter press inks - Zinc & aluminum plates – surface plates – Pre-sensitized plates – anodized aluminum plates – Deep etch plates – multi-metal plates – Automatic plate processing – digraph plates – screen less Plates - Single color offset machines – Multicolor machines – web offset machines – offset lithographic inks

UNIT 5 - REPROGRAPHY,ROTOGRAVURE AND SCREEN PRINTING

Duration: 10 Periods(L:6-T:4)

Process and components - Engraved cylinder - Process - Features - Advantages – Disadvantages - Letter press – lithographic machines – offset letterpress – small offset - xerography – Electrostatic printing – Thermo graphic printing – Die stamping & copper engraving – die line duplication. Conventional gravure – Electrostatic developments - Hand – cut stencils – The dichromate method – photographic stencils – screen fabrics – screen process machines – Squeegees screen process inks – Modern development.

UNIT 6 - FLEXO GRAPHIC, DIGITAL PRINTING AND PROOFING METHODS

Duration: 10 Periods(L:6-T:4)

Evolution - Process overview - Basic parts of the press - Flexographic printing inks - Ink controls - Presses - Applications - Advantages and disadvantages of flexography – flexo graphic printing plates – flexo graphic machines - Color laser-Ink jet prints, proofing methods. Principles of electronic, computer and laser operated devices used in printing.

Reference Books

1. Package design engineering - by Kenneth Brown
2. Packaging- an introduction – by Stanely Sacharow
3. Encyclopedia of Packaging technology – John Willey
4. Paper for printing and Packaging - B .Venkateswarlu
5. A Hand book of printing and packaging technology – by B.Chakravarthy

SUGGESTED LEARNING OUTCOMES

1.0 INTRODUCTION OF PACKAGE DESIGN, OPTIMUM CUSHIONING SELECTIONS

Interpret the optimum cushioning for various products and packages, analyze the various factors to be considered for design of a package.

Construct the load deflection curve.

Select suspension package and design considerations.

2.0 RUBBER SHEAR MOUNTS AND VIBRATION, CONTAINERS, GRAPHIC TOOLS DESIGN

Interpret and analyze the various forces acting on the product inside a package.

Appreciate the necessity of graphic design for a package.

To know the modern trends in designing a package.

Choose the different design considerations, mathematical reviews of container design.

Identify the metal container damages while transporting the product packages

3.0 TYPE PRODUCTION & CAMERA WORK

Compose the types, Learn about pre-press.

Preparation of film using vertical camera.

Development of films, negative and positive preparation, using plate making machine

Developing plates in processing unit

4.0 LETTER PRESS - OFFSET LITHOGRAPHIC PRINTING

Working with letterpress - Offset Lithography printing process

Study of units and operation of the machine

Study of plates, inks and screens.

5.0 REPROGRAPHY,ROTOGRAVURE AND SCREEN PRINTING

Know about the units of reprography machine

Identify different roto gravure process and know the difference between them.

Know the screen printing process and parts of it,

Do printing using screen printing process

6.0 FLEXO GRAPHIC, DIGITAL PRINTING AND PROOFING METHODS

Study the Modern trends in printing process like digital printing

Know the flexography printing machine units and applications

Do the proof reading for the printed information

Suggested Student Activities

1. Each student should visit library to refer to manual/Journals of Packaging related to packaging design and printing.
2. Each student should visit the Lab to know the materials used for package printing.
3. Each student should visit nearby malls and stores to know the various designs and aesthetic printing on packages
4. Students should visit the exhibit stores to know the recent trends and developments in packages.
5. Quiz, Seminar and Group discussion
6. Surprise test

Suggested e-Resources:

1. <http://nptel.ac.in>
2. www.packagingclinic.com
3. www.iip.in.com
4. <https://pcri.org>
5. <https://www.iopp.org/>

Course Outcome		CL	Linked PO	Teaching periods
CO1	Analyse the hazards encountered in distribution and determine protection requirement	R/U/A	1,2,9	8
CO2	Estimate the vibration, shock encountered by a product in distribution on the basis of principles of distribution dynamics	R/U/A	1,2,9,10	12
CO3	Ability to design a package & a packaging system for a particular application.	R/U/A	1,2,6,9	8
CO4	Ability to prove worth of designed package & packaging system.	R/U	1,2	12
CO5	Ability to select proper packaging material for a particular graphics requirement.	R/U/A	1,2,5	8
CO6	Ability to select printing process for a particular requirement.	R/U/A	1,2,3,8,9,10	12
				60

MODEL QUESTION PAPER
BOARD DIPLOMA MID-SEMESTER EXAMINATIONS (C-18)
D.PKGT – IV - SEMESTER EXAMINATION
18PKG-405C - PACKAGE DESIGN ENGINEERING AND PRINTING

TIME: 1 HOUR

MAXIMUM MARKS: 20

PART –A

MARKS: 4 X 1 = 4

NOTE: Answer ALL questions. Each question carries ONE marks.

1. Define Packaging design?
2. What is the role of a packaging designer?
3. What are the elements of a good package design?
4. What are the objectives of package design?

PART –B

MARKS:2 X3 = 6

NOTE: Answer ALL questions. Each question carries THREE marks.

- 5 (a).Draw a figure showing the different sources of information that impact package development?
(OR)
- 5 (b).Write short notes on the
Scanners
DTP
Bar coding
- 6 (a).Write about different types of fabrics used in screen printing.
(OR)
- 6 (b).Expand (i) CAD (ii) CAM (iii) CAE

PART –C

MARKS:2 X5 =10

NOTE: Answer ALL questions. Each question carries FIVE marks.

- 7(a).Write short notes on the
(i).Cushioning systems (ii).Cushioning materials
(OR)
- 7(b).Explain contact printing (+ve preparation) with the help of figure.
- 8(a).Explain Packaging designer's checklist?
(OR)
- 8(b).Explain the importance of designers role in products cost and company's profit?

MODEL QUESTION PAPER
BOARD DIPLOMA SEMESTER END EXAMINATIONS (C-18)
D.PKGT – IV - SEMESTER EXAMINATION
18PKG-405C - PACKAGE DESIGN ENGINEERING AND PRINTING

TIME: TWO HOURS

MAXIMUM MARKS: 40

PART –A

MARKS: 8 X1 = 8

NOTE: Answer ALL questions. Each question carries ONE marks.

1. Name the metals used in plates.
2. What are the different screens?
3. How many types of process films are there?
4. Write about contact printing.
5. What are the steps to expose a line negative or halftone?
6. Give the composition of printing ink.
7. Give the principle of lithographic printing process.
8. Write about different types of fabrics used in screen printing.

PART –B

MARKS:4 X3 =12

Answer ALL questions. Each question carries THREE marks.

- 9(a).Write about the necessity of cushion design for packages?
(OR)
- 9(b).Write the equation of cushion factor ?
- 10(a).Write short notes on the Concepts of 4C in package design
(OR)
- 10(b).Write a short note on shock and vibration?
- 11(a).Write short notes on the photo-optical system
(OR)
- 11(b).Write short notes on the steps to expose a line negative or halftone?
- 12(a).Write about Graphic tools design?
(OR)
- 12(b).What is the importance of CAD in packaging?

PART –C

MARKS:4 X5 =20

Answer ALL questions. Each question carries FIVE marks.

- 13(a).Explain Packaging designer's checklist?
(OR)
- 13(b).Explain contact printing (+ve preparation) with the help of figure.
- 14(a).Explain about punching and creasing machine and draw a sample carton of your choice?
(OR)
- 14(b).Draw a neat sketch of standard reverse tucks end box style and indicate the parts?
- 15(a).Explain the importance of designers role in products cost and company's profit?
(OR)
- 15(b).Explain the steps involved in positive preparation? Draw the vertical camera.
- 16(a).Explain various factors affecting the stacking performance.
(OR)
- 16(b).What is the need of vertical camera? Explain its working with a neat diagram.

QUESTION BANK

18PKG-405C - PACKAGE DESIGN ENGINEERING AND PRINTING

PART-A

1. Define Packaging design and what is the role of a packaging designer?
2. Expand (a) CAD (b) CAM (c) CAE
3. List out all the softwares used in packaging design?
4. What is Package cushioning?
5. Name different types plates in printing processes
6. Name processed films and explain in one sentence.
7. Name different types plates in printing processes
8. Name processed films and explain in one sentence.
9. Give the principles of letter press printing.
10. How many types of films are there?
11. What is contact printing?
12. How many types of printing plates are there?
13. Define surface and Deep-etch plates?
14. Name the metals used in plates.
15. What are the different screens?
16. How many types of process films are there?
17. Write the equation of cushion factor ?
18. What is thermal hardening or baking?
19. What is the necessity of cushion design for packages?
20. What is the importance of printing in packaging?
21. What are the elements of a good package design?
22. What are the objectives of package design?
23. How do you prepare Wipe-on plates?
24. What are the inputs and functions of packaging design?
25. What are the Concepts of 4C in package design?
26. What are the Concepts of 4P in package design?
27. Write about the surface and deep-etch plates?.
28. What is make ready on machines?
29. What are the ligatures and reference marks?
30. What are spacing devices?
31. Write about screen printing applications.
32. How image is formed on gravure machine?
33. Write about contact printing.
34. What are the steps to expose a line negative or halftone?
35. Give the composition of printing ink.
36. Give the principle of lithographic printing process.
37. What is the importance of CAD in packaging?
38. What is reusable packaging?
39. Write about different types of fabrics used in screen printing.

PART-B

1. Write short notes on the different types of fabrics used in screen printing.
2. Write about diphthongs, ligatures and letters in hand composition of letter press in machine.
3. Write short notes on the different types of fabrics used in screen printing

4. Write short notes on the principle of lithographic printing process.
5. Write short notes on the contact printing.
6. Write short notes on the Concepts of 4P in package design
7. Write short notes on the Concepts of 4C in package design
8. Write a short note on shock and vibration?
9. Write short notes on the photo-optical system
10. Write short notes on the spacing devices?
11. Write short notes on the composition of printing ink
12. Write short notes on the Packaging designer's checklist
13. Write short notes on the importance of graphics in packaging.
14. What is flexography printing explain the units? Give examples.
15. Write the classification of the following Cushioning materials
16. Write short notes on the Cushioning systems?
17. Write short notes on the Cushioning materials
18. Draw photo-optical system.
19. Write short notes on the steps to expose a line negative or halftone?
20. Write about Graphic tools design?
21. Write about the necessity of cushion design for packages?
22. Write about the importance of printing in packaging?
23. Write about the elements of a good package design?
24. Write about the objectives of package design?
25. Write a short note on air bubble LDPE film?
26. Write the dimensions of air bubble film in Indian standards?
27. What are the steps involved in negative preparation? Draw the vertical camera.
28. What is flexography printing explain the units ? give examples.
29. Write about the steps involved in preparing film negatives?
30. How will it attract the consumer?
31. Write short notes on the
 - (a) Scanners
 - (b) DTP
 - (c) Bar coding
32. Write about upper case and lower case and other marks in type cases.

PART-C

1. Explain contact printing (-ve preparation) with the help of figure.
2. Explain Packaging designer's checklist?
3. Explain contact printing (+ve preparation) with the help of figure.
4. Draw a figure showing the different sources of information that impact package development?
5. Explain about punching and creasing machine and draw a sample carton of your choice?
6. Draw a neat sketch of standard reverse tucks end box style and indicate the parts?
7. Explain the various stages in EPS production?
8. Explain the importance of designers role in products cost and company's profit?
9. Explain the steps involved in positive preparation? Draw the vertical camera.
10. Explain Screen printing process with sketch.
11. Explain screen printing process with the help of neat sketch.
12. Explain about pre-sensitized plates? How will you develop them?
13. Draw and explain automatic film processing machine units in film Preparation
14. How many types of scanners are there? Explain.
15. With the help of neat sketch, explain offset lithographic printing process.

16. How do you separate colours in colour separation? Explain about folders.
17. With the help of neat sketch, explain vertical camera and procedure for preparing films.
18. Explain the functions of packaging design.
19. Explain the importance of graphics in packaging.
20. Draw the neat sketch of 'type' in hand composition of letter press printing machine. Explain the parts.
21. Explain how cost is related to packaging.
22. Explain various factors affecting the stacking performance.
23. What is the need of vertical camera? Explain its working with a neat diagram.
24. Explain the applications of hologram.
25. Explain the colour separation in printing process.
26. Explain the principal of flexographic printing process with neat sketch.
27. Explain Screen printing process with sketch.
28. Explain about Gravure plate making process?
29. Explain different layers of the film with the help of sketch.
30. Explain the importance of surface decorations in graphic design.
31. What is flexography printing explain the units? Give examples.

COMPONENT DRAWING

Subject Title : **component drawing**

Subject Code : C18PKG406P

Period/Week : 06

Period per Semester : 45

TIME SCHEDULE

Course title:	component drawing			Course Code:	18PKG406P	
				Course group:	Core	
Semester:	III			Credits:		1.5
Teaching scheme in Hrs (LTP):	7.5:0:37.5			Total contact Hrs :	45periods	
Type of course: Lecturer+Practice						
CIE:	60 Marks			SEE:	40 Marks	

Prerequisites: **Basic knowledge of Assembly Drawing.**

COURSE OUTCOMES

	At the end of the course the students will be able to :
1	Understand the difference between machine and production drawing. Use Limits, allowances and tolerances, Differentiate between types of fits and limits
2	Identify tolerance grades and zones, Indicate surface roughness symbols in drawings, Identify the different material of the each component drawing
3	Illustrate production drawings of Basic Components, Interpret production process and the sequence.
4	Illustrate production drawings of various machine components along with process sheet

Course Content and Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions for SEE			Marks Weightage			Weightage
			R	U	A	5M	40M	total	(%)
PART-A									
1	Introduction to production drawing, Limits, fits and tolerances.	06		1		1		05	6%
2	Geometrical Tolerances, Surface finish and standard mechanical component specifications . Reprographic Techniques	09		3		3		15	14%
PART-B									
3	<u>PART DRAWING EXERCISES –I</u> Gib and Cotter joint, Knuckle joint ,Muff	15			1		1	40	40%

	couplings, flange coupling universal coupling, etc.. Process sheet preparation.								
PART-C									
4	PART DRAWING EXERCISES-II Bearings-Foot step Bearing, Plummer block, cross Head, Eccentric , stuffing box etc..	15			1		1	40	40%
	Total	45						100	100%

***NOTE :**

1. Candidate has to answer all questions in part- A and one question from part- B out of two.

2. Part B each question carries 30 marks and distributed for

- component drawing views.....20marks,**
- limits fits and tolerances.....2 marks,**
- geometrical tolerances.....2 marks,**
- surface finish.....2 marks,**
- process sheet4 marks.**

3.Standard components in part-B question need not be drawn.

They are to be designated as per BIS. The marks for them are included in component drawing views

COURSE CONTENTS

1.0 Understand the need of production drawing, Limits, fit and Tolerance and Process sheet preparation

1.1 Introduction and production Drawing of component.

Need of preparing a production drawing, requirements for manufacturing a product like equipment, tools, measuring instruments depending upon processes, accuracy and finish data available in machine drawing – components of a production drawing, fits and tolerances, surface finish, specific processes, material of the component. Read a given assembly drawing – study of the functions of the various parts of the assembly drawing. Preparation of detailed drawing of a specified part of the assembly.

1.2 Definitions of limits, fits and tolerances. Select dimensions from BIS standards to obtain clearance, transition and interference fits for a given set to mating parts – computation of fit and tolerance from BIS table. Preparation of drawing of mating parts and representation of fits and tolerances. Exercises in computing tolerance and representation on the drawings for different types of fits.

1.3 Process sheets : sequence of processes of production for a particular product. Specifications of relevant equipment and tools to obtain the desired accuracy and surface finish. Selection of measuring instruments to check the accuracy.

2.0 Geometrical tolerances to a component, Surface finish and Standard Mechanical component specification

2.1: Need of geometrical tolerances, Types of geometrical tolerances.

Tolerance of profile: profile of a line, profile of a surface.

Tolerance of orientation or attitude : angularity, perpendicularity, parallelism

Tolerance of location: position, concentricity, symmetry,

Composite tolerances : radial run-out, axial run-out

Symbols for geometrical tolerances, indication of geometrical tolerances on components.

Exercises on representation of geometrical tolerances on the drawings

2.2 Surface finish. Indicate Profile of a surface and important characteristics of a surface, Identify the surface texture symbols. Identify Lay direction, surface roughness achievable from different manufacturing processes, Equivalent surface roughness symbols; Indicate the roughness values or grade number and corresponding symbol as per BIS. Indicate surface roughness on drawings.

Exercises on specifying the surface roughness (average values) for functional surfaces of the following machine tool parts.

- Shaft rotating in bush bearing,
- Keys and keyways
- Mounting surfaces for antifriction bearings
- Shaft or bush press fitted into bodies
- Contact surfaces ,example :flanges of pipe fittings
- Peripheral surfaces of pulleys and grooves for v-belts
- Surfaces of control elements example: levers ,hand wheels
- Bases of machines

2.3 Standard Mechanical component specification.

Standard components (parts) are to be designated as per BIS

- Bolts, Nuts, Locknuts ,Washers, Screws and, Studs
- Circlips
- Cylindrical and taper pins
- Keys
- Rivets
- Splines
- Oil seals-rings
- Antifriction bearings:

2.4 Process sheets : sequence of processes of production for a particular product. Specifications of relevant equipment and tools to obtain the desired accuracy and surface finish. Selection of measuring instruments to check the accuracy.

3.0 Production drawing exercises-I

Prepare the relevant views of the part(s) of a given assembly drawing needed for the purpose of production.

Dimension the views obtained and indicate on it with relevant notes the specific processes.

Compute the fit from ISI tables as per the function of the component and indicate the limits at appropriate place on the drawing prepared.

Indicate the geometrical tolerances on the component drawing

Mark the surface finish symbols with indications added.

Prepare the process sheet indicating sequence of processes and equipment, tools, measuring instruments required.

Production drawing exercises-I

- Gib and Cotter joint,
- Knuckle joint,
- Muff couplings,
- flange coupling
- universal coupling,

4.0 Production drawing exercises-II

Prepare the relevant views of the part(s) of a given assembly drawing needed for the purpose of production.

Dimension the views obtained and indicate on it with relevant notes the specific processes.

Compute the fit from ISI tables as per the function of the component and indicate the limits at appropriate place on the drawing prepared.

Indicate the geometrical tolerances on the component drawing

Mark the surface finish symbols with indications added.

Prepare the process sheet indicating sequence of processes and equipment, tools, measuring instruments required.

Production drawing exercises-II

- Foot step Bearing
- Plummer block
- stuffing box
- Eccentric
- Screw jack etc...

NOTE: *In order to develop the abilities required in the preparation of production drawings in the student, the use of actual production drawing from the local industries as exercises to the students is of vital importance.*

REFERENCE BOOKS

IS 696 – 1972-Code of Practice for General Engg. Drawing & B.I.S Code – SP . 46. IS 696 – 1988

Machine Design data hand book – Vol I & II – Dr. K. Lingaiah, (Suma Publishers, Bangalore).

IS Code on fits and tolerances.

Blur print reading for Mechanical Trades by B.R.Sachdeva.

Machine drawing by R.B. Gupta.

Machine Drawing by Siddeswar.

Production Drawing by K.Venkat Reddy

Machine Drawing by Nagpal

COURSE OBJECTIVES

On the completion of the course the student should be able to

1.0 Understand the need of production drawing.

- 1.1 Distinguish the machine drawing from a production drawing.
- 1.2 State the factors that govern the preparation of a production drawing.
- 1.3 Identify the components of a production drawing.
- 1.4 List the function of the component.
- 1.5 Prepare the relevant views of the part and dimension the part.
- 1.6 Indicate the details of specific processes like, heat treatment, welding, counter boring etc.

2.0 Interpret dimension to obtain Limits, fit and Tolerance as per BIS standards.

- 2.1 State the need of Limits, allowance and tolerance
- 2.2 Definition of fit, allowance and tolerance.
- 2.3 Identify tolerance zones and tolerance grades
- 2.4 Classify types of fits, Material conditions, System of limits, specification tolerances
- 2.5 Selection of suitable fit for a given mating part.
- 2.6 Compute the fit from tables.
- 2.7 Indicate fits on the drawings.
- 2.8 Need of geometrical tolerances, Types of geometrical tolerances
- 2.9 Guidelines for indication of feature controlled by geometrical tolerances
- 2.10 Guidelines for indication of datum features, datum planes in space, General principles for applying geometrical tolerances on a component
- 2.11 Identify the need of reprographic and methods like Xerox print etc.
- 2.12 Indicate Profile of a surface and important characteristics of a surface on drawings
- 2.13 Identify the surface texture symbols. Identify Lay direction, surface roughness achievable from different manufacturing processes, Equivalent surface roughness symbols.
- 2.14 Indicate the roughness values or grade number and corresponding symbol as per BIS.
- 2.15 Identify the need of reprographic and methods like Xerox print etc.
- 2.16 Indicate the sequence of process of production.

3.0 Illustrate the ability to draw the component views in exercise I

4.0 Illustrate the ability to draw the component views in exercise II

State Board of Technical Education, Telangana State
C18-MID 1 Examination Model Paper-
PKG-406P COMPONENT DRAWING

TIME : 1 Hour

Max. Marks: 20

PART – A

Marks: 04X 05 M = 20M

Instructions :

1. Answer any **FOUR** questions.
2. Each question carries **FIVE** marks.
3. Answer should be neat & clear with all the necessary Dimensions.
4. All Dimensions are in mm. Choose suitable Scale

1. The dimensions of a shaft and a hole are given Hole: $\phi 40^{+0.039}_{+0.000}$ Shaft: $\phi 40^{+0.062}_{+0.041}$ find out
 - (a) Hole Tolerance
 - (b) Shaft Tolerance
 - (c) Min Allowance
 - (d) Max allowance
 - (e) Type of fit
2. Draw the symbols of the following characteristics to be tolerated:
 - a) Straightness.
 - b) Circularity
 - c) Angularity
 - d) Position.
 - e) Profile of a Line
3. Write the surface roughness values for the following :
 - (a) Hot rolling
 - (b) Cylindrical grinding
 - (c) Lapping
 - (d) Boring
 - (e) Extrusion
4. Indicate the roughness values for the following surface roughness grade numbers :
(a) N 10 (b) N 8 (c) N 6 (d) N 4 (e) N 1
5. Write the meaning of the following designations of mechanical components :
 - (a) Square bolt M12 × 70 N
 - (b) Ball bearing 308
 - (c) Taper key 12 X 8 X 50
 - (d) Fe 470 W
 - (e) Splines 6 X 23 X 26
6. Write about different reprographic techniques.

State Board of Technical Education, Telangana State

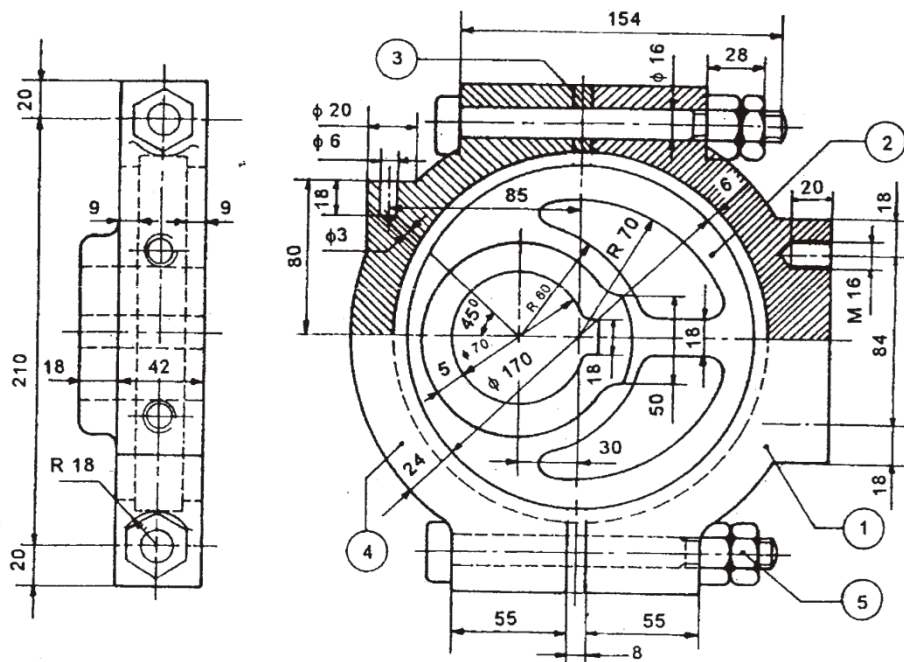
C18-MID 2 Examination Model Paper
PKG-406P COMPONENT DRAWING

TIME : 1Hour

Max. Marks: 20

- Instructions :**
1. Answer any **ONE** questions.
 2. Each question carries **TEN** marks.
 3. Answer should be neat & clear with all the necessary Dimensions.
 4. All Dimensions are in mm. Choose suitable Scale

1. Study the given assembly drawing of the eccentric shown in Figure given below:



Parts List

Part No.	Name	Qty.
1	Strap	1
2	Sheave	1
3	Shim	2
4	Strap	1
5	Bolt with nut	2

- a) Draw the component drawings.
- b) Apply suitable geometric tolerances and fits.
- c) Show the surface roughness symbols.

6. Study the assembly drawing of Foot step bearing as shown in fig :

- (a) Draw the component drawings. 20
- (b) Indicate dimensional tolerances and fits on important mating parts. 2
- (c) Indicate the geometrical tolerances wherever needed. 2
- (d) Indicate the recommended surface roughness values on all parts. 2
- (e) Prepare the bill of materials. 4

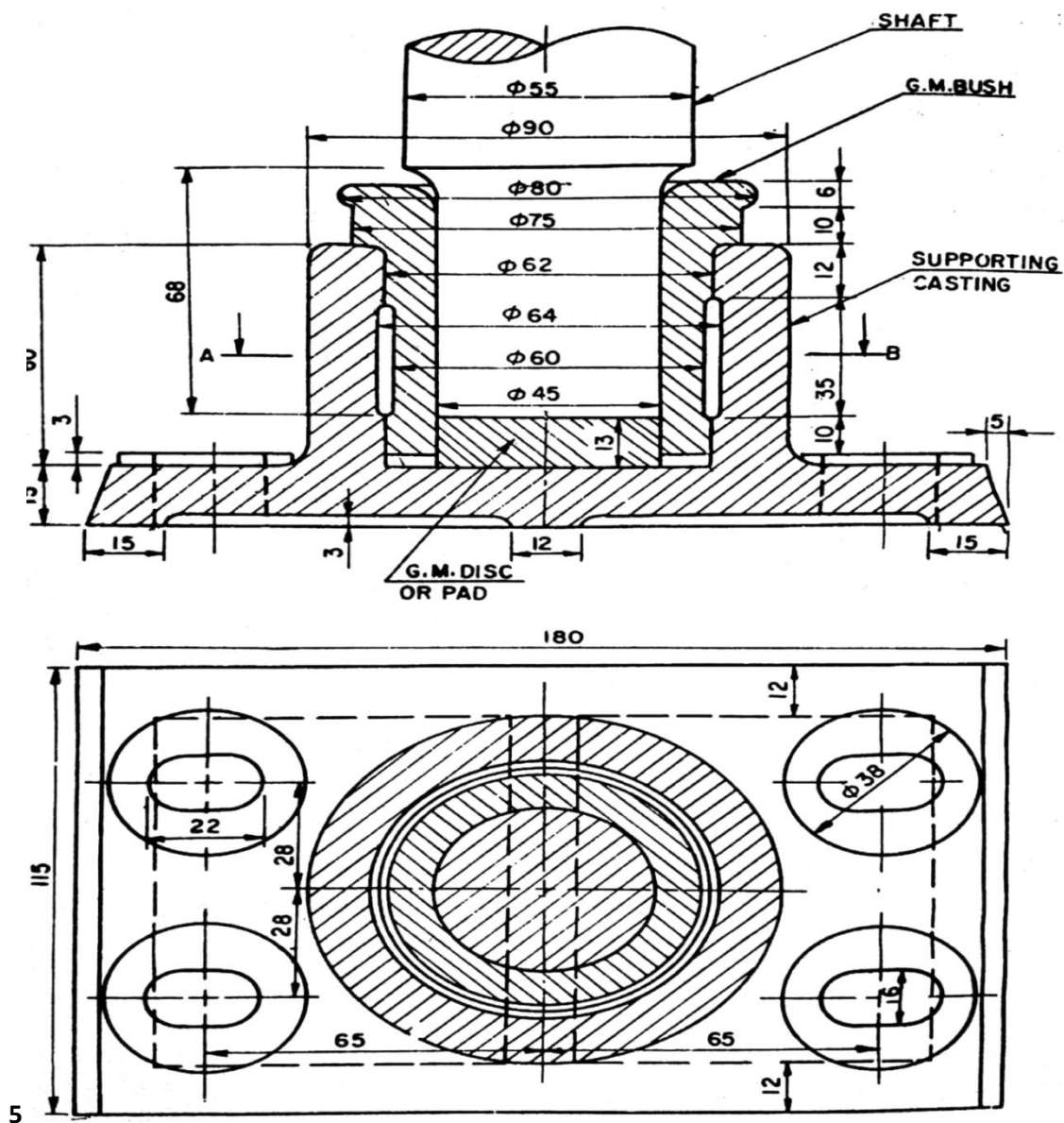


FIG:2 ASSEMBLY OF "FOOT STEP BEARING"

C18-PKG-406

**BOARD DIPLOMA EXAMINATION, (C-18)
DPKG–IV SEMESTER
SEMESTER END EXAMINATION(SEE)**

PKG-406P COMPONENT DRAWING

Time : 2 Hours

[Total Marks: 40]

PART-A

Instructions: 1. Answer all Questions

2X5=10 Marks

2. Each question carries **Five** marks.

3. Answer should be neat & clear with all the necessary Dimensions

4. All Dimensions are in mm. Choose suitable Scale

1. The dimensions of a hole and shaft are given below :

+0.039

+0.062

Hole : 50 +0.000

Shaft : 50 +0.041

Find (a) shaft tolerance, (b) hole tolerance, (c) maximum allowance, (d) minimum allowance and (e) type of fit.

2. Write the meaning of the following designations of mechanical Components:

(a) Hexagonal Bolt M20 × 60 (b) Bearing 100, 10X26X8

(c) Taper key 12 X 8 X50 (d) Stud C M20X50 (e) Splines 6 X 23 X26

PART-B

Instructions:

1X30=30 Marks

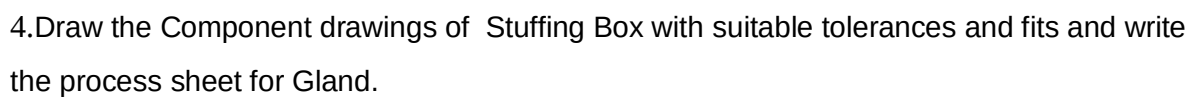
1. Answer any **one** Question

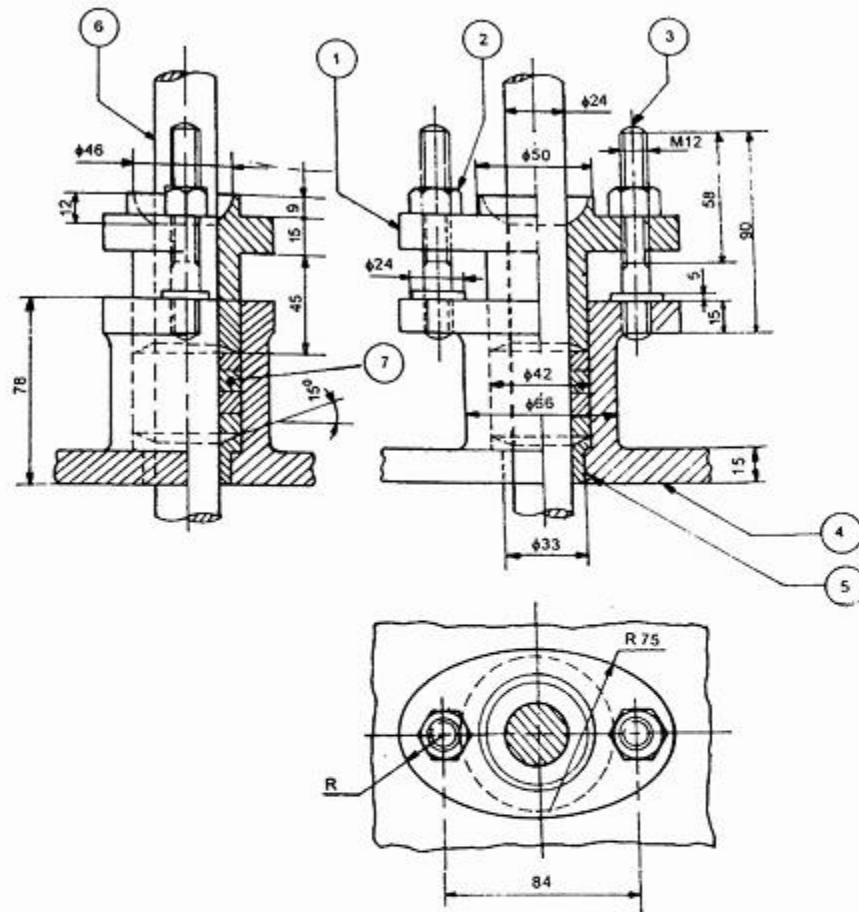
2. Each question carries **30** marks.

3. Answer should be neat & clear with all the necessary Dimensions

4. All Dimensions are in mm. Choose suitable Scale.

2. For the assembly drawing of foot step bearing draw the component drawings indicating fits, roughness values and tolerances, write the process sheet for cover.





Bill of material

Part No.	Name	Raw material	Qty.
1.	Gland	Brass - Casting	1
2.	Nut	MS - Std. component	2
3.	Stud	MS - Std. component	2
4.	Body	C.I - Casting (part of cylinder)	1
5.	Bush	Brass - Casting	1
6.	Shaft	MS	1
7.	Packing	Asbestos rope	

Fig. 9.8 (a) Stuffing Box

18PKG-407P, PLASTIC MATERIALS TESTING LAB PRACTICE

Course Title :	Plastic Materials Testing Lab Practice	Course Code	18PKG-407P
Semester	IV	Course Group	:Core
Teaching Scheme in Periods(L:T:P)	7.5:00:37.5	Credits	: 1.5
Methodology	Lecture + Practical	Total Contact Hours :	:45Pds
CIE	60 Marks	SEE	40 Marks

Pre requisites

This course requires the basic knowledge of 18PKG-403C

Course Content and Blue Print of Marks for SEE

Unit No	Unit name	Hours/ Periods	Questions for SEE			Marks weightage	%Weightage
			Handling	Manipulation	Precision		
1.	Friction test	3	15	10	15	40	100
2.	Folding endurance test of pape(IS 1060-1996) paper/paper board	3	15	10	15	40	100
3.	Water vapour transmission test (WVTR)	3	15	10	15	40	100
4.	Hydraulic/Air pressure test	9	15	10	15	40	100
5.	Bond/Heat seal strength test	9	15	10	15	40	100
6.	Dart-impact test for poly films	6	15	10	15	40	100
7.	Torque test for bottle caps	3	15	10	15	40	100
8.	Melt Flow Index test	3	15	10	15	40	100
9.	P ^H test	6	15	10	15	40	100
	Total	45					

Course outcomes

Course Outcome		CL	Linked PO	Teaching Hours
CO1	Estimate the coefficient of friction/ surface frictional forces of the given poly film.	R/U/A	1,2,3,4,7,9,10	
CO2	Evaluate the folding endurance of paper	R/U/A	1,2,3,4,7,9,10	
CO3	Determine the water vapour transmission rate of given paper.	R/U/A	1,2,3,4,7,9,10	
CO4	Measure the Dart-impact strength of Poly film.	R/U/A	1,2,3,4,7,9,10	
CO5	Estimate the Torque strength required to break the seal of filled bottle cap.	R/U/A	1,2,3,4,7,9,10	
CO6	Examine the Melt flow index of different poly materials.	R/U/A	1,2,3,4,7,9,10	

Course Contents

1. Friction test
2. Folding endurance test of paper(IS 1060-1996) paper/paper board
3. Water vapour transmission rate test (WVTR)
4. Hydraulic/Air pressure test
5. Bond/Heat seal strength test
6. Dart-impact test for poly films
7. Torque test for bottle caps
8. Melt Flow Index test
9. P^H test

State Board of Technical Education and Training, Telangana

Semester End Examination Model Question paper

DPKGT IV semester practical Examination

Corse Code: 18PKG-407P

Duration: 3 hours

Course Name: Plastic Materials Testing Lab Practice

Max. Marks: 40

Instructions to the Candidate:

(i) Answer any One of the following Questions.

(ii) Record the results on a graph sheet if required, and conclude your observation of the experiment

(iii) Draw the diagram for illustration, choose appropriate values when not mentioned in the question

1. Determine the Coefficient of friction of poly surface for different samples.
2. Determine the Folding endurance of different given papers experimentally and compare with poly films
3. Compute the Water vapour transmission rate (WVTR) of different types of papers with the help of Humidity chamber equipment.
4. Determine the Hydraulic/Air pressure resistance capacity of give Bottle/container.
5. Compute the Bond/Heat seal strength of laminated poly films.
6. Determine the Dart-impact strength of given poly films
7. Determine the Torque strength of product filled and sealed bottle caps.
8. Compute the Melt flow index of poly materials
9. Determine the P^H value of liquid products.

18PKG-408P, PACKAGE DESIGN LAB PRACTICE

Course Title :	PACKAGE DESIGN LAB PRACTICE	Course Code	18PKG-408P
Semester	IV	Course Group	:Core
Teaching Scheme in Periods(L:T:P)	7.5:00:37.5	Credits	: 1.5
Methodology	Lecture + Practical	Total Contact Hours :	:45Pds
CIE	60 Marks	SEE	40 Marks

Pre requisites

This course requires the basic knowledge of 18PKG-404C

Course Content and Blue Print of Marks for SEE

Unit No	Unit name	Hours/ Periods	Questions for SEE			Marks weightage	%Weightage
			Handling	Manipulation	Precision		
1.	Design a package for force consideration.	6	15	10	15	40	100
2.	Design a package for impact load.	6	15	10	15	40	100
3.	Design of tension spring package.	6	15	10	15	40	100
4.	Design a fibre board container	6	15	10	15	40	100
5.	Design a plywood container	3	15	10	15	40	100
6.	Design of sheathed crate	3	15	10	15	40	100
7.	Design of metal container	6	15	10	15	40	100
8.	Design of Carton's in different styles	9	15	10	15	40	100
	Total	45					

Course outcomes

Course Outcome		CL	Linked PO	Teaching Hours
CO1	Estimate the coefficient of friction/ surface frictional forces of the given poly film.	R/U/A	1,2,3,4,7,9,10	
CO2	Evaluate the folding endurance of paper	R/U/A	1,2,3,4,7,9,10	
CO3	Determine the water vapour transmission rate of given paper.	R/U/A	1,2,3,4,7,9,10	
CO4	Measure the Dart-impact strength of Poly film.	R/U/A	1,2,3,4,7,9,10	
CO5	Estimate the Torque strength required to break the seal of filled bottle cap.	R/U/A	1,2,3,4,7,9,10	
CO6	Examine the Melt flow index of different poly materials.	R/U/A	1,2,3,4,7,9,10	

Course Contents

- 1 Design a package for deceleration using force consideration.
- 2 Design a optimum cushioning for package under impact load.
- 3 Design of tension spring package.
- 4 Design a fibre board container for given product under given condition.
- 5 Design a plywood container for given product under given condition.
- 6 Design of sheathed crate for a given product.
- 7 Design of metal container for a given product.
- 8 Design of Carton's
 - i. Straight tuck style
 - ii. Reverse tuck style.
 - iii. Interlocking style.
 - iv. Carrier and tray style.
 - v. Carry bag style.
 - vi. Hexagonal style

State Board of Technical Education and Training, Telangana

Semester End Examination Model Question paper

DPKGT IV semester practical Examination

Corse Code:18PKG-408P

Duration:3 hours

Course Name: PACKAGE DESIGN LAB PRACTICE

Max.Marks:40

Instructions to the Candidate:

(i)Answer any One of the following Questions.

(ii)Record the results on a graph sheet if required , and conclude your observation of the experiment

(iii) Draw the diagram for illustration ,choose appropriate values when not mentioned in the question

- 1 Design a package for deceleration using force consideration.
- 2 Design a optimum cushioning for package under impact load.
- 3 Design of tension spring package.
- 4 Design a fibre board container for given product under given condition.
- 5 Design a plywood container for given product under given condition.
- 6 Design of sheathed crate for a given product.
- 7 Design of metal container for a given product.
- 8 Design of Carton in straight tuck style.
- 9 Design of Carton in Reverse tuck style.
- 10 Design of Carton in Interlocking style.
- 11 Design of Carton in Carrier and tray style.
- 12 Design of Carton in Carry bag style.
- 13 Design of Carton in Hexagonal style

18PKG-409P,MATERIAL TESTING LAB PRACTICE

Course Title :	MATERIAL TESTING LAB PRACTICE	Course Code	18PKG-409P
Semester	IV	Course Group	:Core
Teaching Scheme in Periods(L:T:P)	7.5:00:37.5	Credits	: 1.5
Methodology	Lecture + Practical	Total Contact Hours :	:45Pds
CIE	60 Marks	SEE	40 Marks

Pre requisites

This course requires the basic knowledge of (18PKG-302C) Engineering Materials and (18PKG-401C) Strength of materials

Course Content and Blue Print of Marks for SEE

Unit No	Unit name	Hours/Periods	Marks for SEE			Marks weightage	%Weightage
			Handling	Manipulation	Precision		
1.	Tensile test	6	10	10	20	40	100
2.	Compression test	6	10	10	20	40	100
3.	Impact test	6	10	10	20	40	100
4.	Hardness test	6	10	10	20	40	100
5.	Torsion test on springs	6	10	10	20	40	100
6.	Study of micro structure e of metals and alloys	15	15	15	10	40	100

Course outcomes

Course Outcome		Linked PO	Teaching Hours
CO1	Analyze the various parameters in tensile testing	1,2,3,4,5,9,10	06
CO2	Determine the ultimate strength of wood	1,2,3,4,5,9,10	06
CO3	Determine the impact strength	1,2,3,4,5,9,10	06
CO4	Calculate the hardness number of the given material	1,2,3,4,5,9,10	06
CO5	Conduct torsion test on solid shaft and hollow shaft	1,2,3,4,5,9,10	06
CO6	Analyze the micro structure of the metals and alloys	1,2,3,4,5,9,10	15

Course Contents

1. Analyze the various parameters in UTM machine.
2. Determine the ultimate crushing strength of wood. When the load applied perpendicular to grains
And load applied along the grains of the wooden block.
3. Determine the impact strength or toughness of material by conducting an impact test on Izod testing machine.
4. Calculate the hardness number of the given material on Brinell hardness testing machine.
5. Calculate modulus of rigidity by conducting torsion test on solid shaft and hollow shaft
6. Analyze the micro structure of the metals and alloys

State Board of Technical Education and Training, Telangana

Semester End Examination Model Question paper

DPKGT IV semester practical Examination

Corse Code:18PKG-409P

Duration:3 hours

Course Name: MATERIAL TESTING LAB PRACTICE

Max.Marks:40

Instructions to the Candidate:

(i)Answer any One of the following Questions.

(ii)Record the results on a graph sheet if required , and conclude your observation of the experiment

(iii) Draw the diagram for illustration; choose appropriate values when not mentioned in the question

1. Determine the tensile strength of the given material using UTM.
2. Determine the ultimate strength of the given material using UTM.
3. Determine the impact strength or toughness of material by conducting an impact test on izod testing machine.
4. Determine the Brinell hardness number of a given material using BHM.
5. Determine the Rockwell hardness number of a given material.
6. Draw the micro structures of a) Mild Steel b)Pure iron, c) Grey cast iron d)Brass e) Aluminium

Advanced Communication Skills and Life Skills

Course Title	Advanced Communication Skills and Life Skills	Course Code	18PKG-410P (Common)
Semester	IV	Course Group	Foundation
Teaching Scheme in Periods- L:T:P	15:0:30	Credits	1.5
Methodology	Lecture + Practical	Total Contact Hours	45 Periods (3 Periods per Week)
CIE	60 Marks	SEE	40 Marks

Rationale:

This course is designed to impart writing skills and employability skills to the students of diploma which will help them in obtaining and maintaining the employment.

Prerequisites:

This course requires the basic knowledge of vocabulary, grammar and four language learning skills, viz. Listening, Speaking, Reading and Writing.

Course Outcomes:

Modules	At the end of the course the students will have the ability to:
Presentation Skills	Prepare a presentation. Use presentation aids effectively. Develop public speaking skills. Learn to make PowerPoint Presentations effectively. Present a Paper using appropriate body language.
Writing Reports	Learn kinds of reports. Learn the format of a report. Organise ideas. Develop essential vocabulary useful to write scientific and technical reports.
Interview Skills	Learn the techniques to face an interview. Learn the etiquette to communicate with employers. Learn the dos and don'ts of an interview. Learn the frequently asked questions in interviews. Use appropriate body language.

	Learn to face interviews telephonically. Gain the confidence to face an interview by attending mock interview.
Group Discussion	Learn the dos and don'ts of a Group Discussion. Participate in a Group Discussion in a healthy manner. Use effective non-verbal communication. Use appropriate phrases and expressions useful in a group discussion.
Workplace Awareness	Learn workplace etiquette. Identify the knowledge, skills and attributes useful at workplace. Build strong workplace relationships. Learn professional ethics. Understand gender equality at the workplace Develop a sense of responsibility towards the society.
Writing Skills Useful at Workplace	Learn various writing formats useful at workplace. Develop an ability to apply technical information in documentation. Revise and edit written documents effectively. Develop corresponding skills - learn the kinds of business letters - the format of a business letter. Learn effective e-mail writing skills. Learn Business Memos. Learn Notes and Narratives. Learn Forms and Applications. Prepare templates for different purposes. Prepare an agenda of a meeting. Prepare the minutes of a meeting. Prepare Notices / Circulars for various purposes. Prepare Press release.

CO-PO Matrix

	Course Outcome		Linked PO
CO 1	Making effective presentations	R/U/A	1, 2, 3,4, 5,6,7,8,9,10
CO 2	Writing scientific and technical reports	R/U/A	1,2,3,4, 5,6,7,8,9,10
CO 3	Learn to face oral and telephonic interviews	R/U/A	1,2,3,4, 7,9,
CO 4	Learn to face group discussion	R/U/A	1,2,3,7,8,9
CO 5	Learn to write various formats useful at workplace	R/U/A	1,2,3,5,7,8,9,10
CO6	Learn workplace etiquette and ethics	R/U/A	1,2,3,7,8,9,10

Course Contents:

I. Presentation Skills	Duration: 6 periods
II. Writing Reports	Duration: 9 periods
III. Interview Skills	Duration: 9 periods
IV. Group Discussion	Duration: 6 periods
V. Workplace Awareness	Duration: 6 periods
VI. Writing Skills Useful at Workplace	Duration: 9 periods

Suggested Student Activities:

- Paper Presentations
- Seminars
- Mock Interviews
- Telephonic Interviews
- Group Discussions
- Role Plays
- Creating advertisements
- Five-minute activities
- Creating a model of workplace

Evaluation Pattern:

I. Continuous Internal Examination:

60 Marks

- a. **Mid Sem - I** 20 marks
 - Syllabus:
 - i. Presentation Skills
 - ii. Writing Reports
- b. **Mid – II:** 20 Marks
 - Syllabus:
 - i. Interview Skills
 - ii. Group Discussion
- c. **Internal assessment:** 20 marks
 - i. Seminars: 10 marks
 - ii. Assignments: 5 marks
 - iii. Lab record submission: 5 marks

II. Semester End Examination :

40 Marks

- a. Write an essay on a given topic or participate in an activity: 15 Marks
- b. Interview or Group Discussion: 15 Marks
- c. *Viva Voce* 10 marks

References:

- Adair, John. *Effective Communication*. London: Pan Macmillan Ltd., 2003.
- Ajmani, J. C. *Good English: Getting it Right*. New Delhi: Rupa Publications, 2012.
- Amos, Julie-Ann. *Handling Tough Job Interviews*. Mumbai: Jaico Publishing, 2004.
- Collins, Patrick. *Speak with Power and Confidence*. New York: Sterling, 2009.
- Fensterheim, Herbert and Jean Baer. *Don't Say Yes When You Want To Say No*. New York: D
- Raman, Meenakshi & Sangeeta Sharma. *Technical Communication: Principles and Practice*. Second Edition. New Delhi: Oxford University Press, 2011

E-Learning Resources:

- <http://www.dailywritingtips.com/>
- <http://www.englishdaily626.com/c-errors.php>
- <http://www.owlnet.rice.edu/~cainproj/>
- <http://www.thehumorsource.com/>
- <http://www.indiabix.com/group-discussion/topics-with-answers/>
- <http://networketiquette.net/>
- <https://public.wsu.edu/~brians/errors>
- <http://www.bbc.co.uk/worldservice/learningenglish/radio/specials/15>

BOARD DIPLOMA EXAMINATION (C-18)
FOURTH SEMESTER COMMON-18PKG-410P
ADVANCED COMMUNICATION SKILLS AND LIFE SKILLS

MID SEM - I

Time : 1 Hour

Total Marks: 20 Marks

Part – A

10 marks

Instruction: Answer any one of the following questions.

1. Write the guidelines for preparing a PowerPoint presentation.
2. How do you prepare yourself for presenting a technical paper?
3. Mention a few presentation aids and how do you use them effectively?

Part – B

10 marks

Instruction: Answer any one of the following questions.

4. Write the format of a report and describe it.
5. Write a report on the accident you have seen recently.
6. Give the outline of a project report and describe it.

BOARD DIPLOMA EXAMINATION (C-18)
FOURTH SEMESTER COMMON-18PKG-410P
ADVANCED COMMUNICATION SKILLS AND LIFE SKILLS
MID SEM - II

Time : 1 Hour

Total Marks: 20 Marks

Part – A

10 marks

Instruction: Answer any one of the following questions.

1. What are the dos and don'ts for a formal interview?
2. What at least ten frequently asked questions in a formal interview?
3. How do you prepare for a telephonic interview?

Part – B

10 marks

Instruction: Answer any one of the following questions.

4. What are the dos and don'ts of a group discussion?
5. Mention some phrases and expressions commonly used in a group discussion.
6. Write a short paragraph on the steps you take while participating in a group discussion.

BOARD DIPLOMA EXAMINATION (C-18)
FOURTH SEMESTER 18 COMMON-18PKG-410P
ADVANCED COMMUNICATION SKILLS AND LIFE SKILLS
SEMESTER END EXAM

Time : 3 Hours

Total Marks: 40 Marks

Part – A

10 marks

Instruction: Pick any one question from the given lot.

1. Prepare the outline of a project report and describe it.
2. Write the guidelines for preparing the slides of a PowerPoint presentation.
3. Write the minutes of the meeting conducted at the Principal's chamber to conduct the annual day celebrations. Prepare the agenda of the annual day celebrations.
4. Describe the workplace etiquette.
5. Prepare a press note for the '*Job Mela*' which is going to be conducted at your institute.

Part – B

15 marks

6. Interview / Group Discussion

Part – C

15 marks

7. *Viva Voce*

SKILL UPGRADATION IN

IV SEMESTER

Course Title : Skill Upgradation	Course Code :
Semester : IV	Course Group :Practical
Teaching Scheme in Periods (L:T:P) : 0:0:105	Credits :2.5
Methodology : Practicals	Total contact periods :105

1. Ask the students to Study of a jet pump and submersible pump used in the fields
2. Take the students to nearby earthmoving equipment (JCB) servicing work shop; ask to observe the hydraulic circuit installed in earthmoving equipment. Make the sketch and analyze its operation.
3. Study of trouble shooting procedures of various hydraulic and pneumatic circuits
4. Study and think an oil power circuit for an application beyond the syllabus and Draw the circuit diagram , submit hand written report of 500 words.
5. Study and think an pneumatic circuit for an application beyond the syllabus and Draw the circuit diagram , submit hand written report of 500 words.
6. Market Survey specific to properties of Various type of Materials used in Mechanical Engineering and make report.
7. Calculate Moment of Inertia of Fly Wheel of engine present in your laboratory
8. Identify and list real situations which works on:
a: Zeroth law. b: First law of thermodynamics.c: Second law of thermodynamics.
9. Identify different Thermodynamic process in real situations.
10. Prepare charts of diesel, duel and gasoline cycles. Tabulate main points of differences between them.
11. Write the specifications of I.C.Engine of any two wheelers. Also Construct & explain cycle on which that I.C.Engine works.
12. Collect/ download product catalogues with specification of various types of Air compressors used in industry
13. Prepare a of monthly energy consumption of your institute and find the ways how it can be conserved
14. Conduct an energy audit of your institute; suggest the ways how the conventional energy resources utilization can be minimized. Suggest the areas ,where the non-conventional energy may be used
15. Identify the solar intensity and wind speed in your institute locality and calculate the intensity of Solar/Wind Power can be generated.

16. Visit to web site of ministry of renewable energy ,Government of India:<http://mnre.gov.in/>
17. make a Study on 'Developmental Impact and Sustainable Governance aspects of Renewable Energy Projects'
18. Visit solar power plant /wind power plant available in your locality/ nearer to your institute and understand different elements, working, and note the power generation by these plants.
19. Visit the near Industries of food processed and how they are export in thermal and freeze conditions.
20. Each student should visit library to refer to manual/Journals of Packaging related to packaging materials and components.
21. Each student should visit the Lab to know the materials used for packaging.
22. Each student will do the report on Types Different Packages available in the market
23. Prepare any one type of package carrying different food products in market.
24. Identify and prepare a list of materials used in the Different types of packaging applications.
25. Each student should visit library to refer to manual/Journals of Packaging related to packaging design and printing.
26. Each student should visit the Lab to know the materials used for package printing.
27. Each student should visit nearby malls and stores to know the various designs and aesthetic printing on packages
28. Students should visit the exhibit stores to know the recent trends and developments in packages.
29. Each student should visit library to refer to manual/Journals of food Packaging
30. Each student should visit the Lab to know the materials used for food packaging.
31. Each student will do the report on Types Different Packages available in the market
32. Prepare any one type of package carrying different food products in market.
33. Identify and prepare a list of materials used in the Different types of packaging applications.
34. Each student should visit library to refer to manual/Journals of Packaging related to packaging materials and components.
35. Each student should visit CIPET to know and analyze the different poly materials and its applications in packaging industry.
36. Each student will do the report on Different plastic materials available in the market
37. Prepare list of poly materials used in food industry.
38. Identify and prepare a list of materials used in the Different types of packaging applications.
39. Identify consumer and commercial factors that should be considered when designing a new product
40. Describe the product to be developed for the food product
41. Develop and evaluate potential product formulations
42. Propose the manufacturing process for the product to be developed
43. Choose the most suitable packaging for the food product
44. Evaluate the shelf-life of the food product
45. Locate and describe the laws applicable to the ingredients used to ensure the safety of the developed product
46. Develop a nutritional label for the food product

47. Identify critical control points and limits of the proposed process
48. Estimate operating costs and investment required to start the production line.
49. Quiz, Seminar and Group discussion
50. Surprise test