M-401 DESIGN OF MACHINE ELEMENTS
MODEL BLUE PRINT OF THE QUESTION PAPER

Sl. No	Chapter Name	Periods Allocated	Weightage Allocated	Question Wise Distribution of Weightage			Marks Wise Distribution of Weightage		
				R	U	Ap	R	U	Ap
1	Threaded Joints	8	13	1	-	1	3	-	10
2	Shafts, Keys and Couplings.	14	26	1	1	2	3	3	20
3	**Power Transmission Drives** (a) Belt and Chain Drives.	10	16	1	1	1	3	3	10
	(b) Gear Drives	08	16	1	1	1	3	3	10
4	Cams	08	13	-	1	1	-	3	10
5	Elements of Internal Combustion Engines.	12	26	1	1	2	3	3	20
TOTAL		**60**	**110**	**5**	**5**	**08**	**15**	**15**	**80**

Note: R-Remembering; U-Understanding; Ap-Applying;

Unit Test - 1

Q.No	Question from the topic	Blooms category	Marks allocated	CO addressed
PART-A(16 marks)				
1	Definitions and Statements	R,U	4	CO1, CO2,CO3
2	Threaded Joints	U	3	CO1
3	Shafts, Keys and Couplings	U	3	CO2
4	Shafts, Keys and Couplings	U	3	CO2
5	Belt and Chain Drives	U	3	CO3
PART-B(24 marks)				
6	Threaded Joints	Ap	8	CO1
7	Shafts, Keys and Couplings	Ap	8	CO2
8	Belt and Chain Drives	Ap	8	CO3

Unit Test - 2

Q.No	Question from the topic	Blooms category	Marks allocated	CO addressed
PART-A(16 marks)				
1	Definitions and Statements	R,U	4	CO3 to CO5
2	Gear Drives	U	3	CO3
3	Cams	U	3	CO4
4	Elements of Internal Combustion Engines	U	3	CO5
5	Elements of Internal Combustion Engines	U	3	CO5
PART-B(24 marks)				
6	Gear Drives	Ap	8	CO3
7	Cams	Ap	8	CO4
8	Elements of Internal Combustion Engines	Ap	8	CO5

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UNIT TEST - 1

DESIGN OF MACHINE ELEMENTS

Time : 90 Minutes Total Marks: **40**

PART – A

Instructions: *1st Question having 4 one mark questions, and remaining 4Questions carry 3 marks each*

1. (a) The ratio of Ultimate stress to allowable stress is called----------

   (b) The core diameter of M20 bolt is----------

   (c) State the function of Shaft.

(d) State the condition for maximum power transmission in the belt drive.

2. How a screw thread is designated? Give an example.
3. A gib headed key is used to connect a shaft of 60 mm diameter with a gear. Draw the gib headed key with the proportions.
4. List the characteristics of a good shaft coupling?
5. Two pulleys 800 and 400 mm diameters which are fixed to two parallel shafts 4 m apart are connected by open belt. Find the length of belt required and angle of contact.

PART – B

Instructions: *Part B consists of **3** Units. Answer any one full question from each unit. Each question carries 8 marks and may have sub questions.*

6. Explain the basic procedure of designing of machine members

(OR)

Design and draw an Eye bolt which is to be used for lifting an electric machine of load 5 kN. Ultimate stress of the material is 600 MPa and the factor of safety is 6. Design the eyebolt from the proportionate dimensions.

7. A solid circular shaft is subjected to a bending moment of 3000 Nm and a torque of 10000 Nm. The shaft is made of steel having ultimate tensile stress of 700 MPa and ultimate shear stress of 500 MPa. Assuming a factor of safety of 6. Determine the suitable diameter of the shaft. **(OR)**

Design and draw a protective cast iron flange coupling for a steel shaft transmitting 15 kW power at 200 rpm and having an allowable shear stress of 40 N/mm^2. The working stress in the bolts should not exceed 30 N/mm^2. Assume that the same material is used for the shaft and key and that the crushing stress is twice the value of its shear stress. The maximum torque is 25 % greater than the mean torque. The shear stress for cast iron is 14 N/mm^2.

8. Two pulleys 1.2 m and 0.5 m diameter are on parallel shaft 3.6 m apart, and are connected by an open belt drive. The belt has a mass of 0.9 kg/m length, and the maximum tension in it is not to exceed 2000 N. The larger pulley which is the driver runs at 3.5 rev/s and coefficient of friction between belt and pulley is 0.25. Calculate the power transmitted by the belt. **(OR)**

A belt transmitting power from a motor to a machine weighs 24 N/metre and the maximum permissible tension in it is 1000 N. The belt embraces 5/9 of the pulley circumference. Coefficient of friction is 0.28. If the belt runs under maximum power condition, determine the optimum belt speed and maximum power transmitted.

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UNIT TEST - 2

DESIGN OF MACHINE ELEMENTS

Time : 90 Minutes Total Marks: **40**

PART – A

Instructions: *1st Question having 4 one mark questions, and remaining 4Questions carry 3 marks each*

1. (a) Define circular pitch of gear
   (b) Define Base circle of a cam
   (c) Write the function of bearing
   (d) Classify the chain drives
2. Classify the gears.
3. How do you classify the followers?

4. Write the differences between Governor and Fly wheel?
5. Define mechanical vibration.

PART – B

Instructions: *Part B consists of **3** Units. Answer any one full question from each unit. Each question carries 8 marks and may have sub questions.*

6. Explain the following gear trains with neat sketches and mention their applications.

a). Simple gear train, and b). Compound gear train.

(OR)

A three speed sliding gear box of a motor car is required to give speed ratios of 4:1, 2.5:1 and 1.5 :1 for the first, second and third gear respectively. Diametral pitch of all gears is 0.3 /m and the centre distance between mating gears is 70 mm. Find the suitable number of teeth for various gears, if the number of teeth on pinion is 14. Sketch the arrangement.

7. A cam is to give the following motion to a knife edged follower:

a). Outstroke during 90° of cam rotation;
b).Dwell for the next 30° of cam rotation;
c). Return stroke during next 120° of cam rotation, and
d). Dwell for the remaining 120° of cam rotation.

The stroke of the follower is 40 mm and the minimum radius of the cam is 30 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when the axis of the follower passes through the axis of the cam shaft.

(OR)

A cam is to be designed for a roller follower with the following data:

a). Outstroke during 120° of cam rotation;
b). Dwell for the next 30° of cam rotation;
c). Return stroke during next 90° of cam rotation, and
d). Dwell for the remaining part of cam rotation.

The stroke of the follower is 50 mm and the minimum radius of the cam is 25 mm. The diameter of the roller is 20 mm. The follower moves with simple harmonic motion during both the outstroke and return stroke. Draw the profile of the cam when the axis of the follower passes through the axis of the cam shaft.

8. Compare the sliding contact bearings with rolling contact bearings

(OR)

Explain Porter governor with a sketch.

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DME – IV-SEMESTER END EXAMINATION
DESIGN OF MACHINE ELEMENTS

PART – A

Instructions: Answer all the questions **3 x 10=30**
Each question carries THREE marks

1. What are the factors to be considered while designing a machine element?
2. Write the function of Shaft and Axle.
3. Define Couplings. Classify the Couplings.
4. Distinguish between Open and Crossed belt drives.
5. State the advantages and disadvantages of Belt drive.
6. Define the terms a). Circular pitch b). Module
7. Write the differences between involute and cycloidal tooth profiles.

8. Classify the Cams.
9. Write the functions and classification of bearings.
10. Write the differences between Flywheel and Governors.

PART - B

Instructions: Answer any FIVE the questions **5 x 10 = 50**

Each question carries TEN marks

11. Design and draw an Eye bolt which is used for lifting an electric machine load of 5 kN. Take Ultimate stress of the material as 600 MPa and the factor of safety as 6. Give the proportions of the eyebolt designed.
12. A steel shaft transmits 4 kW at 800 RPM. The angular deflection should not exceed 0.25^{o} per meter length of the shaft. If the modulus of rigidity for the material of the shaft is 84×10^3 N/mm^2, find the diameter of the shaft .
13. Design and draw a muff coupling to connect two shafts transmitting 100 kW power at 200 rpm. The permissible shearing and crushing stresses for shaft and key material are 50 N/mm^2 and 100 N/mm^2 respectively. The material for muff is cast iron with a permissible shear stress of 15 N/mm^2. Assume that the maximum torque transmitted is equal to the mean torque.
14. A flat belt drive is used to transmit 15 kW power from an electric motor to a flourmill. The following data is available.
    Thickness of belt: 10 mm; Density of belt material: 1.1 gm/cm^3 .
    Motor pulley diameter: 1400 mm; Motor pulley speed: 135 rpm;
    Stress in the belt: 2.4 MN/m^2 . Angle of contact: 2.75 radians;
    Coefficient of friction: 0.3;
    Determine the width of the belt.
15. Explain the following gear trains with neat sketches and mention their applications.
    i). Simple gear train and ii). Compound gear train.
16. A cam is to be designed for a knife edge follower with the following data:
    a). Cam lift = 50 mm during 120° of cam rotation with Simple Harmonic Motion.
    b). Dwell for the next 30°.
    c). During the next 120° of cam rotation, the follower returns to its original position with simple harmonic motion.
    d). Dwell during the remaining.
    Draw the profile of the cam when the line of stroke of the follower passes through the axis of the cam shaft and the radius of the base circle of the cam is 35 mm.
17. Describe the working of Porter governor with a legible sketch.
18. Explain the methods of controlling the vibrations in mechanical systems.

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