O.P.Code: 23ME0321	R23	H.T.No.										

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech. III Year II Semester Regular Examinations April-2026

DESIGN OF MACHINE MEMBERS

(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 70**

PART-A

(Answer all the Questions **10 x 2 = 20** Marks)

1	a	Define endurance limit.	CO1	L1	2M
	b	Write key theories of failure for static loads.	CO1	L2	2M
	c	Distinguish between a 'transverse' and a 'parallel' fillet weld.	CO2	L1	2M
	d	What are stresses that act on screw fastening?	CO2	L2	2M
	e	What is the difference between rigid and flexible coupling?	CO3	L1	2M
	f	What is the difference between torsional rigidity and lateral rigidity?	CO3	L1	2M
	g	Describe the significance of the spring constant (k) in a helical spring.	CO4	L2	2M
	h	Explain the importance of wire diameter in spring design	CO4	L2	2M
	i	How does gear ratio affect the performance of a gear system?	CO5	L2	2M
	j	What factors influence the design of a shoe brake?	CO5	L1	2M

PART-B

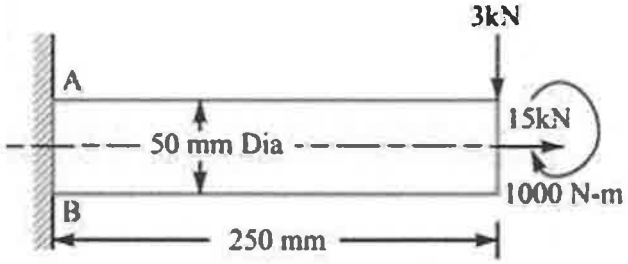
(Answer all Five Units **5 x 10 = 50** Marks)

UNIT-I

2	a	Explain the general design procedure while designing a machine element.	CO1	L2	5M
	b	A hydraulic press exerts a total load of 3.5 MN. This load is carried by two steel rods, supporting the upper head of the press. If the safe stress is 85 MPa and E = 210 kN/mm^2 . Find : 1. Diameter of the rods 2. Extension in each rod in a length of 2.5m	CO1	L2	5M

OR

3	a	Derive a relation for shear stress developed in a shaft, when it is subjected to torsion.	CO1	L3	5M
	b	A shaft, as shown in Figure. is subjected to a bending load of 3 kN, pure torque of 1000 N-m and an axial pulling force of 15 kN. Calculate the stresses at A and B.	CO1	L3	5M

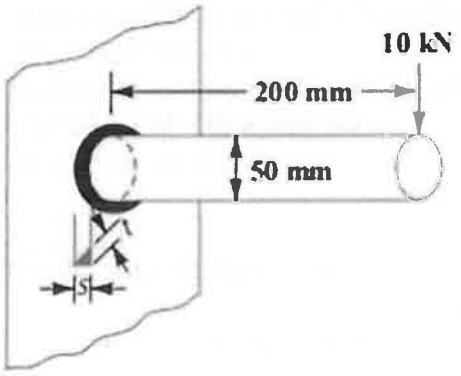


UNIT-II

4	a	Discuss on bolts of uniform strength giving examples of practical applications of such bolts.	CO2	L2	5M
	b	A plate 100 mm wide and 10 mm thick is to be welded to another plate by means of double parallel fillets. The plates are subjected to a static load of 80 kN. Find the length of weld if the permissible shear stress in the weld does not exceed 55 MPa.	CO2	L3	5M

OR

5	a	A 50 mm diameter solid shaft is welded to a flat plate as shown in Figure. If the size of the weld is 15 mm, find the maximum normal and shear	CO2	L2	5M



stress in the weld.

	b	Explain Stress in screw fasteners due to Combined Forces?	CO2	L2	5M

UNIT-III

6	a	A solid shaft is transmitting 1 MW at 240 r.p.m. Determine the diameter of the shaft if the maximum torque transmitted exceeds the mean torque by 20%. Take the maximum allowable shear stress as 60 MPa	CO3	L3	5M
	b	An universal coupling is used to connect two mild steel shafts transmitting a torque of 5000 N-m. Assuming that the shafts are subjected to torsion only, find the diameter of the shafts and pins. The allowable shear stresses for the shaft and pin may be taken as 60 MPa and 28 MPa respectively.	CO3	L3	5M

OR

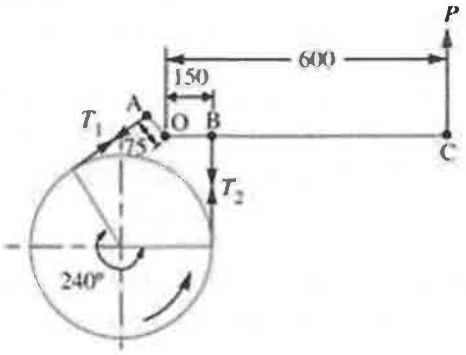
7		Design and make a neat dimensioned sketch of a muff coupling which is used to connect two steel shafts transmitting 40 kW at 350 r.p.m. The material for the shafts and key is plain carbon steel for which allowable shear and crushing stresses may be taken as 40 MPa and 80 MPa respectively. The material for the muff is cast iron for which the allowable shear stress may be assumed as 15 MPa	CO3	L3	10M

UNIT-IV

8	a	What factors should be considered while designing a friction clutch?	CO4	L2	4M
	b	Design a spring for a balance to measure 0 to 1000 N over a scale of length The spring is to be enclosed in a casing of 25 mm diameter. The approxima number of turns is 30. The modulus of rigidity is 85 kN/mm^2 . Also calcula maximum shear stress induced.	CO4	L3	6M

OR

9		A differential band brake, as shown in Fig. has a drum diameter of 600 mm and the angle of contact is 240°. The brake band is 5 mm thick and 100 mm wide. The coefficient of friction between the band and the drum is 0.3. If the band is subjected to a stress of 50 MPa, find : 1. The least force required at the end of a 600 mm lever, and 2. The torque applied to the brake drum shaft.	CO4	L3	10M



All dimensions in mm.

UNIT-V

10	Design a journal bearing for centrifugal pump from the following data:Load on the journal = 20 kN , Speed of the journal = 900 rpm, Type of oil SAE 10 for which absolute viscosity at 55°C = 17 centipoises. Ambient temperature of oil = 15.5°C Maximum bearing pressure for the pump = 1.5 N/mm^2 . Calculate also the mass of the lubricating oil required for artificial cooling to rise in temperature of the oil limited to 10°C. Heat dissipation coefficient = 12.2 kN/m^2 /°C	**CO5**	**L3**	**10M**
	OR			
11	A pair of straight spur gears is required to reduce the speed of shaft from 500 to 100 rpm while continuously running 12hr per day. The pinion is of 40C8 steel and has 20 teeth. The wheel is of cast iron of grade FG200 and has 100 teeth. The gears are of 8mm module, 100 mm face width and 20^0 pressure angle. Calculate power rating.	**CO5**	**L3**	**10M**

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