O.P.Code: 20ME0314	R20	H.T.No.									

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech III Year I Semester Regular & Supplementary Examinations February-2024

DESIGN OF MACHINE ELEMENTS-I

(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 60**

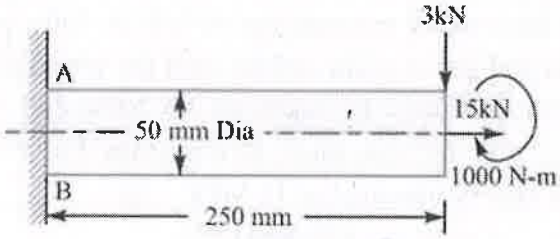
(Answer all Five Units **5 x 12 = 60** Marks)

UNIT-I

1	a	Define preferred numbers and explain its applications.	CO1	L1	6M
	b	Identify various manufacturing consideration to be followed in designing a machine element.	CO1	L2	6M

OR

2		A shaft, as shown in Fig. is subjected to a bending load of 3 kN, pure torque of 1000N-m and an axial pulling force of 15 kN. Calculate the stresses at A and B.	CO1	L3	12M



Fig

UNIT-II

3		A mild steel shaft of 50 mm diameter is subjected to a bending moment of 2000 N-m and a torque T. If the yield point of the steel in tension is 200 MPa, find the maximum value of this torque without causing yielding of the shaft according to 1. the maximum principal stress; 2. The maximum shear stress; and 3. the maximum distortion strain energy theory of yielding.	CO2	L3	12M

OR

4	a	Illustrate how the stress concentration in a component can be reduced.	CO2	L2	4M
	b	Explain Goodman's and Soderberg's equation for combination stresses	CO2	L2	8M

UNIT-III

5	a	Explain Stress in screw fasteners due to Combined Forces?	CO3	L2	6M
	b	Describe the initial stresses induced in screw fasteners due to screwing up forces.	CO3	L2	6M

OR

UNIT-IV

7	a	How the shaft is designed when it is subjected to twisting moment only?	CO4	L2	5M
	b	A shaft made of mild steel is required to transmit 100 kW at 300 r.p.m. The supported length of the shaft is 3 metres. It carries two pulleys each weighing 1500 N supported at a distance of 1 metre from the ends respectively. Assuming the safe value of stress, determine the diameter of the shaft.	CO4	L3	7M

OR

8		Design a sleeve and cotter joint to resist a tensile load of 60 kN. All parts of the joint are made of the same material with the following allowable stresses: Tensile stress = 60 MPa; shear stress = 70 MPa; and compressive stress = 125 MPa.	CO5	L3	12M

UNIT-V

9	a	What are the forces acting on sunk key? Explain with neat sketch	CO6	L1	4M
	b	A 15 kW, 960 r.p.m. motor has a mild steel shaft of 40 mm diameter and the extension being 75 mm. The permissible shear and crushing stresses for the mild steel key are 56 MPa and 112 MPa. Design the keyway in the motor shaft extension. Check the shear strength of the key against the normal strength of the shaft.	CO6	L3	8M

OR

10	a	Discuss the function of a coupling. Give at least three practical applications.	CO6	L1	4M
	b	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.	CO6	L3	8M

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