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Reg. No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech III Year I Semester Supplementary Examinations August-2022

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**	What are the general design consideration should be followed while designing a machine element.	**L1**	**6M**
	b	An unknown weight falls through 10 mm on a collar rigidly attached to the lower end of a vertical bar 3 m long and 600 mm2 in section. If the maximum instantaneous extension is known to be 2 mm, what is the corresponding stress and the value of unknown weight? Take E = 200 kN/mm2.	**L4**	**6M**

OR

2	**a**	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/mm2, Find: i) diameter of the rods, ii) extension in each rod in a length of 2.5m.	**L4**	**6M**
	b	What do you mean by preferred numbers and explain the applications	**L1**	**6M**

UNIT-II

3		Explain stress concentration in detail and various methods to reduce stress concentration in machine members.	**L1**	**12M**

OR

4		A simply supported beam has a concentrated load at the centre which fluctuates from a value of P to 4 P. The span of the beam is 500 mm and its cross-section is circular with a diameter of 60 mm. Taking for the beam material an ultimate stress of 700 MPa, a yield stress of 500 MPa, endurance limit of 330 MPa for reversed bending, and a factor of safety of 1.3, calculate the maximum value of P. Take a size factor of 0.85 and a surface finish factor of 0.9.	**L4**	**12M**

UNIT-III

5	**a**	Explain briefly the method of riveting.	**L1**	**6M**
	b	Double riveted double cover butt joint in plates 20 mm thick is made with25 mm diameter rivets at 100 mm pitch. The permissible stresses are :σt = 120 MPa; τ = 100 MPa; σc= 150 MPa Find the efficiency of joint, taking the strength of the rivet in double shear as twice than that of single shear.	**L4**	**6M**

OR

6	**a**	Sketch and discuss the various types of welded joints used in pressure vessels. What are the considerations involved.	**L1**	**6M**
	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.	**L4**	**6M**

UNIT-IV

7	A shaft is supported by two bearings placed 1 m apart. A 600 mm diameter pulley is mounted at a distance of 300 mm to the right of left hand bearing and this drives a pulley directly below it with the help of belt having maximum tension of 2.25 kN. Another pulley 400 mm diameter is placed 200 mm to the left of right hand bearing and is driven with the help of electric motor and belt, which is placed horizontally to the right. The angle of contact for both the pulleys is180° and $\mu = 0.24$. Determine the suitable diameter for a solid shaft, allowing working stress of63 MPa in tension and 42 MPa in shear for the material of shaft. Assume that the torque on one pulley is equal to that on the other pulley.	**L4**	**12M**

OR

8	Design a gib and cotter joint to carry a maximum load of 35 kN. Assuming that the gib, cotter and rod are of same material and have the following allowable stresses : $\sigma t = 20$ MPa ; $\tau = 15$ MPa ; and $\sigma c = 50$ MPa.	**L4**	**12M**

UNIT-V

9	The shaft and the flange of a marine engine are to be designed for flange coupling, in which the flange is forged on the end of the shaft. The following particulars are to be considered in the design : Power of the engine = 3 MW; Speed of the engine = 100 r.p.m. Permissible shear stress in bolts and shaft = 60 MPa ; Number of bolts used = 8 Pitch circle diameter of bolts = 1.6 × Diameter of shaft Find: 1. diameter of shaft; 2. diameter of bolts; 3. thickness of flange; and 4. diameter of flange.	**L4**	**12M**

OR

10	Design and draw a protective type of cast iron flange coupling for a steel shaft transmitting 15 kW at 200 r.p.m. and having an allowable shear stress of 40 MPa. The working stress in the bolts should not exceed 30 MPa. Assume that the same material is used for shaft and key and that the crushing stress is twice the value of its shear stress. The maximum torque is 25% greater than the full load torque. The shear stress for cast iron is 14 MPa.	**L4**	**12M**

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