Course Code: 2050317 **Roll No:** **MLRS-R20**

19/12/22 (AN)

MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section2(f) & 12(B)of the UGC act,1956

III B.Tech I Sem Regular End Examination, December 2022

Design of Machine Members-I

(Mechanical)

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

Note: 1. Question paper consists: Part-A and Part-B.
2. In Part – A, answer all questions which carries 20 marks.
3. In Part – B, answer any one question from each unit.
Each question carries 10 marks and may have a, b as sub questions.

PART- A

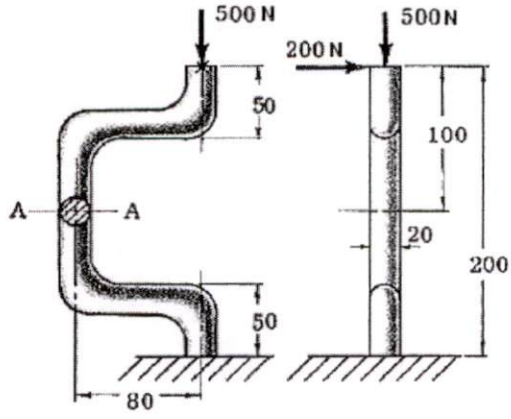
(10*2 Marks = 20 Marks)

1.	a)	How do you classfy materials for materials use?	2M	CO1	L1
	b)	Define the terms stress and strain. List the various types of stresses.	2M	CO1	L1
	c)	What are the various permanent and detachable fastenings? Give a complete list with the different types of each category.	2M	CO2	L1
	d)	What do you understand by the term welded joint? How it differs from riveted joint?	2M	CO2	L2
	e)	Distinguish between cotter joint and knuckle joint	2M	CO3	L2
	f)	What is a key ? State its function.	2M	CO3	L1
	g)	What is the function of a spring?	2M	CO4	L1
	h)	Classify springs according to their shapes	2M	CO4	L2
	i)	Distinguish clearly, giving examples between pin, axle and shaft.	2M	CO5	L2
	j)	What are the different types of stresses induced in shafts	2M	CO5	L1

PART- B

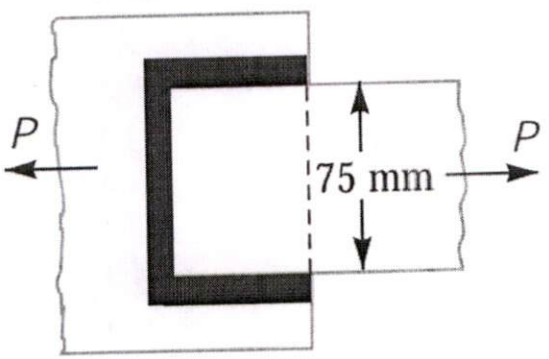
(10*5 Marks = 50 Marks)

2	a)	Calculate the maximum numerical normal stress and the maximum shear stress at section A-A in the member loaded as shown in the figure below.	10M	CO1	L3



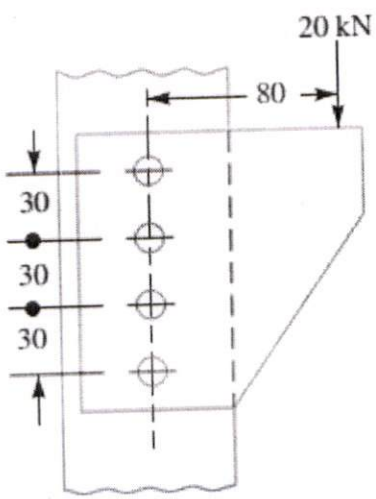
OR

3	A transmission shaft of cold drawn steel 27Mn2 (σult = 500 N/mm2 and σy = 300 N/mm2) is subjected to a fluctuating torque which varies from -125 to 250 N-m. The factor of safety is 2 and the expected reliability is 90%. Neglecting the effect of stress concentration, determine the diameter of the shaft. Assume the maximum principle stress method.	10M	CO1	L3
4	A plate 75 mm wide and 12.5 mm thick is joined with another plate by a single transverse weld and a double parallel fillet weld as shown in Fig. The maximum tensile and shear stresses are 70 MPa and 56 MPa respectively. Find the length of each parallel fillet weld, if the joint is subjected to static loading	10M	CO2	L3



OR

5	A bracket is supported by means of 4 rivets of same size, as shown in Fig. below. Determine the diameter of the rivet if the maximum shear stress is 140 MPa.	10M	CO2	L3



All dimensions in mm.

6	Design the rectangular key for a shaft of 50 mm diameter. The shearing and crushing stresses for the key material are 42 MPa and 70 MPa.	10M	CO3	L3

OR

7	Design a cotter joint to connect piston rod to the crosshead of a double acting steam engine. The diameter of the cylinder is 300 mm and the steam pressure is 1 N/mm2. The allowable stresses for the material of cotter and piston rod are as follows : σt = 50 MPa ; τ = 40 MPa ; and σc = 84 MPa Assume suitable data wherever necessary	10M	CO3	L3
8	Design a helical spring for a spring loaded safety valve (Ramsbottom safety valve) for the following conditions : Diameter of valve seat = 65 mm ; Operating pressure = 0.7 N/mm2; Maximum pressure when the valve blows off freely = 0.75 N/mm2; Maximum lift of the valve when the pressure rises from 0.7 to 0.75 N/mm2 = 3.5 mm ; Maximum allowable stress = 550 MPa ; Modulus of rigidity = 84 kN/mm2; Spring index = 6. Draw a neat sketch of the free spring showing the main dimensions.	10M	CO4	L3
	OR			
9	A semi-elliptical laminated vehicle spring to carry a load of 6000 N is to consist of seven leaves 65 mm wide, two of the leaves extending the full length of the spring. The spring is to be 1.1 m in length and attached to the axle by two U-bolts 80 mm apart. The bolts hold the central portion of the spring so rigidly that they may be considered equivalent to a band having a width equal to the distance between the bolts. Assume a design stress for spring material as 350 MPa. Determine : 1. Thickness of leaves, 2. Deflection of spring, 3. Diameter of eye, 4. Length of leaves, and 5. Radius to which leaves should be initially bent.	10M	CO4	L3
10	A solid circular shaft is subjected to a bending moment of 3000 N-m and a torque of 10 000 N-m. The shaft is made of 45 C 8 steel having ultimate tensile stress of 700 MPa and a ultimate shear stress of 500 MPa. Assuming a factor of safety as 6, determine the diameter of the shaft.	10M	CO5	L3
	OR			
11	Design a rigid flange coupling to transmit a torque of 250 N-m between two coaxial shafts. The shaft is made of alloy steel, flanges out of cast iron and bolts out of steel. Four bolts are used to couple the flanges. The shafts are keyed to the flange hub. The permissible stresses are given below: Shear stress on shaft =100 MPa Bearing or crushing stress on shaft =250 MPa Shear stress on keys =100 MPa Bearing stress on keys =250 MPa Shearing stress on cast iron =200 MPa Shear stress on bolts =100 MPa	10M	CO5	L3

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