

**1622**

**Code : 15ME53T**

Register  
Number

--	--	--	--	--	--	--	--	--	--

**V Semester Diploma Examination, Oct./Nov.-2019**

**MACHINE DESIGN**

**Time : 3 Hours ]**

**[ Max. Marks : 100**

- Note :**
- (i) Answer all questions.
  - (ii) Any missing data may be suitably assumed.
  - (iii) Use of design data hand book is permitted.

**PART - A**

1. Label the salient features of stress-strain diagram for mild steel. 5
2. List the types of display. 5
3. Explain man-machine joint system. 5

**PART - B**

4. (a) List the applications of rivetted joints. 5
- (b) A double rivetted lap joint is made between 15 mm thick plates, the rivets are 25 mm diameter and pitch is 75 mm. If allowable stress in tension, shear and crushing are 400 MPa, 320 MPa and 640 MPa, find safe load and efficiency. 15

**OR**

- (a) Explain stress induced in screw fasteners when it is subjected to static loading. 5
- (b) The cylinder head of steam engine subjected to a pressure of 0.7 N/mm<sup>2</sup>. It is held in position by 12 bolts. A soft copper gasket is used to make the joint leak proof. The effective diameter of cylinder is 300 mm. Find size of bolts, so that the stresses in bolts is not to exceed 100 MPa. 15

5. (a) Explain how shaft is designed when it is subjected to twisting moment only, on strength basis. 5
- (b) A shaft transmits 20 kW at 200 rpm. The ultimate shear stress of shaft may be taken as 360 MPa and factor of shafty as 8. Find suitable diameter of shaft. If the shaft is replaced by hollow shaft. Find inside and outside diameter of shaft. If the ratio of inside diameter to outside diameter is 0.5. 15

OR

- (a) Explain the effect of key way cut into the shaft. 5
- (b) A shaft of diameter 80 mm transmits power at maximum shear stress 63 MPa. Find the length of the key to mount a pulley on the shaft. If the width of the key is 20 mm and shear stress in the key material not to exceed 42 MPa. 15
6. (a) List the applications of springs. 5
- (b) Design a closed coil helical compression spring for a load range from 2500 N to 3000 N. The axial deflection of the spring for the load range is 6 mm. Assume spring index of 5. The permissible shear stress is 420 MPa and modulus of rigidity  $G = 84 \text{ kN/mm}^2$ . Neglect stress concentration. 15

OR

- (a) Define the terms : 5
- (i) Solid length
  - (ii) Free length
  - (iii) Spring index
  - (iv) Spring rate
  - (v) Pitch of springs
- (b) Design a helical compression spring for a maximum load of 1000 N, find deflection 25 mm. Value of spring index may be taken as 5. The maximum permissible shear stress for the spring is 420 MPa and modulus of rigidity is  $84 \text{ kN/mm}^2$ . Consider Wahl's factor as  $K = \frac{4C-1}{4C-4} + \frac{0.165}{C}$ , where "C" is spring index. 15

**PART - C**

7. Design a Knuckle joint to transmit 150 kN. The allowable stresses for rod and pins are  $75 \text{ N/mm}^2$ ,  $60 \text{ N/mm}^2$  and  $150 \text{ N/mm}^2$  in tension, shear and crushing respectively. 25
-