

Code: ME5T5

**III B.Tech - I Semester – Regular/Supplementary Examinations
October 2018**

**DESIGN OF MACHINE MEMBERS-I
(MECHANICAL ENGINEERING)**

Duration: 3 hours

Max. Marks: 70

Note: Use of approved designed data books is permitted

PART – A

Answer *all* the questions. All questions carry equal marks

11x 2 = 22 M

1.

- a) How would you classify machine design?
- b) State the Maximum Shear stress theory of elastic failure.
- c) How will you reduce stress concentration in threaded parts ?
- d) Differentiate between Soderberg, Goodman and Gerber lines.
- e) What are the assumptions made in the design of Welded joints ?
- f) What do you understand by the term “Efficiency of the Riveted Joint”?
- g) Why the bolts less than M16 should not normally be used in Pre-loaded joints ?
- h) Differentiate between Cotter and Knuckle joint. Give one practical example for each.
- i) State the relations for the deflection and Maximum shear stress produced in the helical compression springs.

- j) Explain the influence of Wahl's factor in the design of helical springs ?
k) What are the Preferred numbers?

PART – B

Answer any **THREE** questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) Explain the factors to be considered in Machine Design. 6 M
- b) A hollow shaft of 40 mm outer diameter and 25 mm inner diameter is subjected to a twisting moment of 120 N-m simultaneously; it is subjected to an axial thrust of 10 kN and a bending moment of 80 N-m. Calculate the maximum normal and shear stresses. 10 M
3. a) A forged steel bar, 50 mm in diameter, is subjected to a reversed bending stress of 250 N/mm^2 . The bar is made of steel 40C8 ($S_{ut} = 600 \text{ N/mm}^2$). Calculate the life of the bar for a reliability of 90 %. 6 M
- b) Analyse the various factors to be considered in estimation of endurance limit of the Mechanical components. 10 M
4. a) Explain the procedure adopted for designing an eccentrically loaded riveted joint. 6 M

- b) Steel plates of 7 mm thickness are connected by a triple riveted lap joint of Zig-zag pattern. Compute the rivet diameter, rivet pitch and distance between rows of rivets for the joint. The permissible working stresses are tensile stress 90 MPa, shear stress 60 MPa and compressive stress 120 MPa. 10 M
5. Design a Cotter joint to support a load varying from 30 kN in tension to 30 kN in compression. The following allowable stresses may be used for the material of the joint. Tensile stress = Compressive stress = 50 MPa, Shear stress = 35 MPa and Crushing stress = 90 MPa. 16 M
6. a) Explain the construction of Multi-leaf spring with a neat Sketch. 6 M
- b) A safety valve, 40 mm in diameter, is to blow off at a pressure of 1.2 MPa. It is held on its seat by means of a helical compression spring, with initial compression of 20 mm. The maximum lift of the valve is 12 mm. The spring index is 6. The spring is made of cold drawn steel wire with ultimate tensile strength of 1400 N/mm^2 . The permissible shear stress can be taken as 50 % of this strength. ($G = 81370 \text{ N/mm}^2$). Calculate : 10 M
- (i) Wire diameter (ii) Mean coil diameter and (iii) Number of active coils.