

DESIGN OF MACHINE MEMBERS – I

(Mechanical Engineering)

Use of Design data books is permitted in the examination hall

Time: 3 hours

Max. Marks: 70

PART – A

(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- (a) What are the basic requirements of machine elements?
 - (b) What is the significance of theories of failure?
 - (c) Define notch sensitivity.
 - (d) How is shock load produced?
 - (e) What are the modes of failure of riveted joints?
 - (f) What are the uses of screw fasteners?
 - (g) What is meant by a bolt of uniform strength?
 - (h) Write down the applications of cotter joint.
 - (i) In case of propeller shaft of a ship, the shaft is subjected toloads?
 - (j) Where do you find the applications of flange couplings?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

- 2 How do you classify materials for engineering use?

OR

- 3 Draw the stress-strain diagram for mild steel. Explain.

UNIT – II

- 4 Write down Goodman's equation for combination stresses.

OR

- 5 A circular bar of 500 mm length is supported freely at its ends. It is acted upon by a central concentrated cycle having a minimum value of 2000 kgf and a maximum value of 5000 kgf. Determine the diameter of bar by taking a factor of safety of 1.5; size effect of 0.85; surface finish factor of 0.9. The material properties of bar are given by; ultimate strength of 65 kgf/mm²; yield strength of 50 kgf/mm² and endurance strength of 35 kgf/mm².

UNIT – III

- 6 Explain the procedure for design of longitudinal butt-joint and circumferential lap-joint for a cylindrical boiler shell.

OR

- 7 Derive an expression for the maximum load in a bolt when a bracket with circular base is bolted to a wall by means of four bolts- eccentric loading.

UNIT – IV

- 8 Two steel rods are to be connected by means of a steel sleeve and two steel cotters. The rods are subjected to a tensile load of 40 kN. Design the joint, using the permissible stress in tension as 60 MPa, in shear as 50 MPa, and in crushing as 90 MPa.

OR

- 9 Write detailed notes on the design of hollow shafts.

UNIT – V

- 10 Discuss briefly about: (i) Flange coupling. (ii) Muff coupling with neat sketches.

OR

- 11 Design a cast iron solid muff coupling for a mild steel shaft to transmit 40 kW at 350 rpm. The allowable shear stress in the key and shaft is not to exceed 45 MPa and that in the cast iron sleeve is 15 MPa.
