

R09

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

B. Tech III Year I Semester Examinations, June/July-2014

DESIGN OF MACHINE MEMBERS-I

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- 1.a) Discuss the factors which govern the selection of a material for a machine component.
- b) What is factor of safety? Define and differentiate between failure stress, design stress and working stress.
2. Describe the theories of failure applied to fatigue loading design.
3. A double riveted lap joint with Zig-Zag riveting is to be designed for 13 mm thick plates. Assume $\sigma_t = 80$ MPa; $\tau = 60$ MPa ; and $\sigma_c = 120$ MPa. State how the joint will fail and find the efficiency of the joint.
- 4.a) Discuss on bolts of uniform strength giving examples of practical applications of such bolts.
- b) Explain the method of determining the size of the bolt when the bracket carries an eccentric load perpendicular to the axis of the bolt.
5. Design and draw a cotter joint to support a load varying from 30 KN in compression to 30 KN in tension. The material used is carbon steel for which the following allowable stresses may be used. The load is applied statically. Tensile Stress = Compressive stress = 50 MPa; Shear Stress = 35 MPa and Crushing Stress = 90 MPa.
- 6.a) A hollow shaft has greater strength and stiffness than solid shaft of equal weight. Explain.
- b) A shaft running at 400 rpm transmits 10 KW Assuming allowable shear stress in shaft as 40 MPa. Find the diameter of the shaft.

7. 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 considered in the design

Power of the engine = 3 MW

Speed of the engine = 100 rpm

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.
- 8.a) Explain the free length, solid height, spring rate and spring index of the spring with neat sketch.
- b) A helical spring is made from a wire of 6 mm diameter and has outside diameter of 75 mm. If the permissible shear stress is 350 MPa and modulus of rigidity 84 KN/mm² , Find the axial load which the spring can carry and the deflection per active turn.
