

Model Question Paper (CBCS) with effect from 2015-16

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Fifth Semester B.E. Degree (CBCS) Examination

Design of Machine Elements-1

Time: 3 hrs.

Max. Marks: 80

- Note:** 1. Answer any FIVE full questions, choosing one full question from each module.
2. Use of Design Data Hand Book permitted.
3. Any missing Data may be assumed suitably.

MODULE – I

- 1 a Explain codes and Standards in Design with Suitable examples. (06 Marks)
b A machine member is subjected to a twisting moment of 2 kNm and a bending moment of 4kNm. Find Suitable diameter of the shaft if the normal and shear stresses are 120MPa and 75MPa respectively. (10 Marks)

OR

- 2 a Define Stress Concentration and give Three examples of how to reduce Stress Concentration. (08 Marks)
b Find the Thickness of a flat plate as shown in the Fig Q2(b) subjected to a tensile load of 90kN. The allowable stress for the plate material is 120 MPa. (08 Marks)

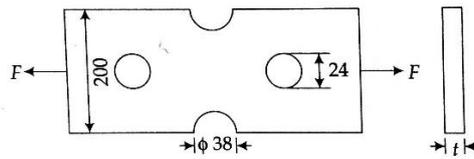


Fig Q2(b)

MODULE – II

- 3 a Derive Equation for Impact Stress in Axial Load. (07 Marks)
b A bar of rectangular cross section with sides ratio as 2 is 300 mm long. It is subjected to an axial impact by a load of 1.5kN that fall on it from a height of 12 mm. Determine the dimensions of the bar if the allowable stress is 120 MPa. (09 Marks)

OR

- 4 a Derive Soderberg's Equation (06 Marks)
b A round rod of diameter 1.2d is reduced to a diameter d with a fillet radius of 0.1d. This stepped rod is to sustain a twisting moment that fluctuates between +2.5kN-m and +1.5kN-m together with a bending moment fluctuates between +1kN-m and -1kN-m. The rod is made of carbon steel ($\sigma_y = 330$ MPa and $\sigma_u = 620$ MPa). Determine the diameter 'd'. Take load factor = 1 for bending and 0.6 for torsion, size factor and surface finish factors = 0.85 and factor of safety = 2.0. (10 Marks)

MODULE – III

- 5 a A solid steel shaft running at 600 rpm is supported on bearings 600 mm apart. The shaft receives 40kW through a 400 mm diameter pulley weighing 400N located 300mm to the right of left bearing by a vertical flat belt drive. The Power is transmitted from the shaft through another pulley of diameter 600mm weighing 600N located 200 mm to the right of right bearing. The belt drives are at right angles to each other and ratio of belt tensions is 3.0. Design the shaft if the allowable shear stress in the shaft material is 40 MPa while taking steady loads. (16 Marks)

Important Note: 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written e.g. 38+2 = 40, will be treated as malpractice.

OR

- 6 a Classify keys and show that square key is equally strong in shear and compression. (08 Marks)
- b Design a protected type cast iron flange coupling for a steel shaft transmitting 30 kW at 200 rpm. The allowable shear stress in the shaft and key material is 40 MPa. The maximum Torque transmitted to be 20% greater than the full load torque. The allowable shear stress in the bolt is 60 MPa and allowable shear stress in the flange is 5 MPa. (08 Marks)

MODULE – IV

- 7 a Explain Various strengths of Riveted Joints (04 Marks)
- b Design a double riveted butt joint with two cover plates for the longitudinal seam of a boiler shell 1.5m in diameter subjected to a steam pressure of 1MPa. Assume an efficiency of 75%, allowable stress in the plate and rivets as 90 MPa (Tension), 140 MPa (crushing) and 56 MPa (shear) respectively. (12 Marks)

OR

- 8 a Two plates are joined by means of Fillet welds as shown in Fig 8(a). The leg dimensions of the welds is 10 mm and permissible shear stress at the throat cross section is 75 MPa. Determine the length of each weld. (06 Marks)

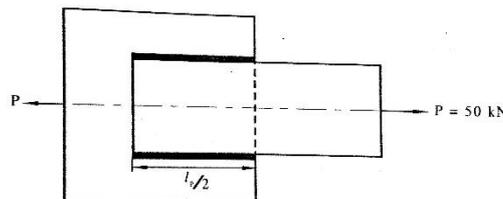


Fig Q8(a)

- b A Welded connection of steel plates is as shown in Fig Q8 (b). Determine the throat dimensions of weld, if the allowable stress is 90 MPa. (10 Marks)

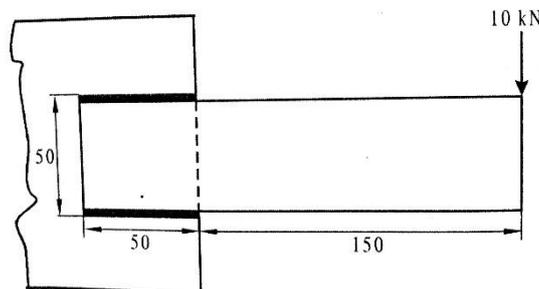


Fig Q8(b)

MODULE – V

- 9 a A bolt in a steel structure is subjected to a tensile load of 9 kN. The initial tightening load on the bolt is 5kN. Determine the size of bolt taking allowable stress for the bolt material as 80 MPa and using copper gasket. (06 Marks)

- b** A bracket is fixed to the wall by means of bolts and loaded as shown in Fig Q9(b). (10 Marks)
Determine the size of bolts taking allowable shear stress of bolt material as 40 MPa.

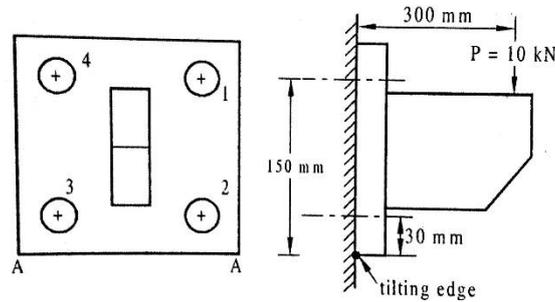


Fig Q9(b)

OR

- 10 a** Explain self-locking in power screws. (04 Marks)
- b** A Power screw for a jack has square threads of proportion 50 mm x 8 mm. The coefficient of friction of the threads is 0.1 and the collar is 0.12. Determine the weight that can be lifted by this jack through an effort of 350 N at the end of a lever of length 400 mm. (12 Marks)
