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Total Number of Pages: 2

**B.TECH**  
**PCME4303**

**5<sup>th</sup> Semester Regular / Back Examination 2016-17**  
**DESIGN OF MACHINE ELEMENTS**

**BRANCH(S): MANUFAC, MANUTECH, MECH, PE**

**Time: 3 Hours**

**Max Marks: 70**

**Q.CODE: Y444**

**Answer Question No.1 which is compulsory and any five from the rest.**

**The figures in the right hand margin indicate marks.**

**Q1 Answer the following questions: (2 x 10)**

- a) Differentiate between grey cast iron and malleable cast iron.
- b) What actually the surface roughness number represents and how is it obtained?
- c) When a riveted joint is called an eccentrically loaded one?
- d) List out different type of stresses to which a screwed fastener is generally subjected.
- e) What is the purpose of using a Gib along with a cotter?
- f) Define the term equivalent bending moment and equivalent twisting moment.
- g) Define terms: Mechanical Advantage and Leverage in context of a lever?
- h) What is meant self-locking property of thread and where is it desirable?
- i) Which welded joint is designed for shear strength?
- j) Differentiate between Flexible Coupling and Rigid Coupling

**Q2 Two lengths of mild steel tie rod having width 200 mm and thickness 12 mm are to be connected by means of a butt joint with double cover plates. Design the joint if the allowable stress are 75 MPa in tension and 55 MPa in shear and 130 MPa in crushing. Provide the sketch of the joint. (10)**

**Q3 a) Calculate the tolerances, fundamental deviations and limits of size for hole and shaft for the given fit 60H<sub>7</sub>m<sub>6</sub>. (5)**

- b) A 50 mm diameter 200 mm long horizontal solid shaft is welded at its one end to the vertical face of a column by fillet weld. Determine the maximum normal and shear stress in the weld if the size of the weld is 15 mm and it is subjected to a transverse load of 15 kN at its free end. (5)

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- Q4 a)** A 2 m long line shaft rotating at 200 rpm is to transmit 20 kW. The allowable shear stress for the material of the shaft is 42 MPa. If the shaft carries a central load of 10 kN and is simply supported at ends, determine the diameter of the shaft **(5)**
- b)** Design a bell crank lever to apply a load of 5 kN (vertical) at the end A of the horizontal arm of length 400 mm. The end of the vertical arm C and the fulcrum B are to be fixed with the help of pins inside forked shaped support. The end is itself forked. Determine the cross-section of the arm and the dimensions of the pins the lever is to have a mechanical advantage of 4 with a shorter vertical arm BC. The allowable stress in shear and tension for the pin and lever are 100 MPa and 125 MPa respectively. The allowable bearing pressure for pin is  $12 \text{ N/mm}^2$ . **(5)**
- Q5** Design a CI protective flange coupling to connect two shafts in order to transmit 7.5 kW at 720 rpm. The permissible shear stress and crushing stress for shaft, bolt and key material may be assumed as 33 MPa and 60 MPa respectively. The permissible shear stress for CI is 15 MPa. Draw the sketch of the coupling. **(10)**
- Q6** Two rods are to be joined by a sleeve type cotter joint. The joint is subjected to an axial load of 100 kN. The permissible stresses for rod sleeve and cotter material are 80 MPa in tension, 60 MPa in shear and 120 MPa in crushing. Design the joint and give a neat dimensional sketch of the joint. **(10)**
- Q7** Design a knuckle joint to withstand an axial load of 70 kN. The eye end and fork end and pin of the joint are made of mild steel having permissible stress of 75 MPa in Tension, 50 MPa in shear and 120 MPa in crushing. Give a neat dimensional sketch of the joint. **(10)**
- Q8** Design a square threaded screw jack to raise a load of 25 kN through a height of 250 mm. The compressive strength of screw material is 330 MPa. The Rankine constant is  $1/7500$  for column pin joined at both ends. Use a factor of safety 4. The permissible shear stress for nut material is 25 MPa and its bearing pressure is 10 MPa. The coefficient of friction for threads as well as for collar may be assumed as 0.14. **(10)**
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