

GUJARAT TECHNOLOGICAL UNIVERSITY**B.E. Sem-III Remedial Examination May 2011****Subject code: 131902 Subject Name: Machine Design & Industrial Drafting****Date: 27-05-2011****Time: 10.30 am – 01.30 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain the following terms with neat sketches. **04**
1) Tensile stress 2) Compressive stress
3) Principle Stress 4) Bearing pressure
- (b) Classify the different types of load & Explain each In brief. **03**
- (c) Explain surface roughness symbols & importance of it. **04**
- (d) Differentiate between assembly drawing & detail drawing. **03**

- Q.2** (a) Enlist different types of cotter joint & explain design procedure of any one. **07**
- (b) A Knuckle joint is required to sustain a tensile load of 30 kN. Design the joint, if the permissible stresses are $\sigma_t = 55 \text{ Mpa}$, $\tau = 42 \text{ Mpa}$, $\sigma_c = 70 \text{ Mpa}$. **07**

OR

- (b) Design a cast iron flange coupling for a mild steel shaft transmitting 90 kw at 250 rpm. The allowable shear stress in the shaft is 40 Mpa and the angle of twist is not to exceed 1 degree in a length of 20 diameters. The allowable shear stress in the coupling bolts is 30 Mpa. Take width of key = shaft diameter/4 & thickness of key = shaft diameter/6. Assume no. of bolts = 4. **07**

- Q.3** (a) Explain various failures of rivetted joints. **04**
- (b) Explain the following terms related to rivetted joints. **03**
1) Pitch 3) Margin
2) Diagonal pitch
- (c) Design a double riveted butt joint with two cover plates for the longitudinal seam of a boiler shell 1.5 m in diameter subjected to a steam pressure of 0.95 N/mm^2 . Assume joint efficiency as 75%, allowable tensile stress in the plate 90 Mpa, Compressive stress 140 Mpa & shear stress in the rivet 56 Mpa. **07**

OR

- Q.3 (a)** An eccentrically loaded lap riveted joint is to be designed for a steel bracket as shown in fig.-1. The bracket plate is 25 mm thick. All rivets are to be of same size, load on the bracket $P = 50 \text{ kN}$, rivet spacing $c = 100 \text{ mm}$, load arm $e = 400 \text{ mm}$, permissible shear stress is 64 Mpa , and crushing stress is 120 Mpa . Determine the size of the rivets to be used for the joint. **07**

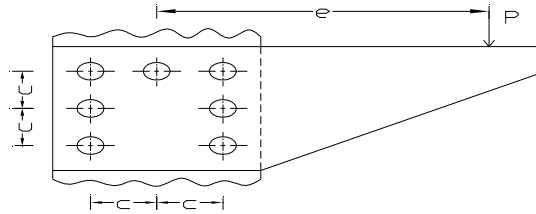


fig.-1

- (b)** State the types of welded joints & mention the stresses produced in welds in each of joints and explain the general design procedure to design the welded joints. **07**
- Q.4 (a)** State & Explain the various criteria on which shaft are designed? **04**
- (b)** A shaft transmits 75 kW power at 300 rpm load is gradually Applied. It is also subjected to B.M. of 500 N-M , shear stress in shaft material should not exceed 40 N/mm^2 . Shaft must not twist more than 2° per meter length. Modulus of rigidity of shaft material is $0.8 \times 10^5 \text{ N/mm}^2$. Find the diameter of solid shaft. If the shaft is chosen is hollow with inside to outside diameter ratio $= 0.5$, Find the size of the hollow shaft. What is the percentage saving in material by using hollow shaft instead of solid shaft? **10**

OR

- Q.4 (a)** Explain purpose & requirement of shaft coupling. **03**
- (b)** Explain stress concentration & methods of reducing it by sketches. **04**
- (c)** Design a bottle type screw jack for lifting a load of 150 kN (Only screw & nut) and having maximum lift of 300 mm . Select proper material & stresses. **07**
- Q.5 (a)** What is lever? Explain the principle on which it works. **04**
- (b)** Explain clearly the necessity of providing bosses on the lever at pin locations. **03**
- (c)** Design a right angled bell crank lever having one arm 500 mm & the other 150 mm long. The load of 5 kN is to be raised acting on a pin at the end of 500 mm arm & the effort is applied at the end of 150 mm arm. The lever consists of steel forgings, turning on a point at the fulcrum. The permissible stresses for the pin & lever are 84 Mpa in tension & compression & 70 Mpa in shear, the bearing pressure on the pin is not to exceed 10 N/mm^2 . **07**

OR

- Q.5 (a)** Differentiate between hole basis system & shaft basis system with necessary sketches. **04**

- (b) Give symbol for straightness, flatness, perpendicularity, cylindricity, symmetry & angularity. **03**
- (c) Explain following autocad command with example. **07**
- 1) copy 4) Trim 7) line
 - 2) Mirror 5) Extend
 - 3) Polyline 6) Hatch
