Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
B. E. - SEMESTER – III • EXAMINATION – WINTER 2012

Subject code: 131902 **Date: 04-01-2013**
Subject Name: Machine Design & Industrial Drafting
Time: 10.30 am – 01.00 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)** State the difference between shaft, axle and spindle. **04**
 (b) A line shaft is driven by means of a motor placed vertically below it. The **10** pulley on the line shaft is 1.5 meter in diameter and has belt tensions 5.4 kN and 1.8 kN on the tight side and slack side of the belt respectively. Both these tensions may be assumed to be vertical. If the pulley be overhang from the shaft, the distance of the centre line of the pulley from the centre line of the bearing being 400 mm, find the diameter of the shaft. Assuming maximum allowable shear stress of 42 MPa.

Q.2 **(a)** What do you mean by eccentric loaded welded joint? Write the detail design **07** procedure for designing such a joint.
 (b) A circular shaft, 75 mm in diameter, is welded to the support by means of a **07** circumferential fillet weld. It is subjected to a torsional moment of 3000 N-m. Determine the size of weld, if the maximum shear stress in the weld is not to exceed 70 N/mm^2.

OR

 (b) Explain the important terminology of riveted joints and find the efficiency of **07** the double riveted lap joints with zig-zag riveting is to be designed for 13 mm thick plates. Assume 80 MPa., 60 MPa and 120 MPa in tension, Shear and crushing respectively. Also calculate pitch of rivets.

Q.3 **(a)** Draw neat sketch of Gib & cotter joint showing all the parts. **05**
 (b) It is required to design a cotter joint to connect two steel rods of equal **09** diameter.

The permissible stresses for the rods, spigot end and socket end are σ_t =96 N/mm^2, σ_c = 134 N/mm^2 & τ = 45 N/mm^2.
For cotter,
σ_t =80 N/mm^2 , τ = 40 N/mm^2. Each rod is subjected to an axial Tensile force of 80 KN. Calculate following dimensions:

1. Diameter of spigot 2. Width & thickness of cotter 3. Thickness of socket collar

OR

Q.3 **(a)** "Square key is stronger against crushing than rectangular key". Justify the **05** statement.

[P.T.O.

(b) Design a muff coupling to transmit 30 kW at 100 rpm. The allowable shear **09** stress for the shaft and key is 40 MPa and the number of bolts connecting the two halves are 6. The permissible tensile stress for the bolts is 70 MPa. The coefficient of friction between the muff and the shaft surface may be taken as 0.3. Take width of key = Shaft diameter/4 and thickness of key = Shaft diameter/6.

Q.4 **(a)** What is self locking of power screw? Explain. **05**

(b) A triple threaded power screw, used in a screw jack, has a nominal diameter **09** of 50 mm and a pitch of 8 mm. The threads are square and the length of nut is 48 mm. The screw jack is used to lift a load of 7.5 kN. The coefficient of friction at the threads is 0.12 and collar friction is negligible. Calculate: (i) the principal shear stress in the screw body, (ii) the transverse shear stresses in the screw and the nut, (iii) the unit bearing pressure. State whether the screw is self-locking or not.

OR

Q.4 **(a)** What do you understand by overhauling of screw? **05**

(b) A 'C' frame of the press takes a load of 100 kN at an eccentricity of 250 mm. **09** Calculate the cross-sectional dimensions of the frame, considering the section of frame 'I' – section with thickness of web and flange being 't', depth '6t' and width '3t'. The material of the frame has permissible tensile stress, $[\sigma_t]$ = 100 MPa.

Q.5 **(a)** Explain lever and leverage. **05**

(b) A bell crank lever is to be designed to raise a load of 15 kN at the short arm **09** end. The arm lengths are 150 mm and 500 mm. The permissible stresses for lever and pin materials in shear and tension are 60 MPa and 90 MPa respectively. The bearing pressure on the pin is to be limited to 12 MPa. Assume the lever cross section as t x 4t and fulcrum pin length as 1.25 times pin diameter.

OR

Q.5 **(a)** Explain following commands of AutoCAD with suitable example. **07**
      (i)   Mirror
      (ii)   Stretch
      (iii)   Scale

(b) Explain "Shaft base system" and "Hole base system" with necessary **07** examples..

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