C.U.SHAH UNIVERSITY
Summer-2015

Subject Code: 4TE03MDI1   **Subject Name: Machine Design & Industrial Drafting**
Course Name:B.Tech (Mech,Auto)   Date: 8/5/2015
Semester:III   Marks : 70
                                             Time:02:30 TO 05:30
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Instructions:
   1) Attempt all Questions of both sections in same answer book/Supplementary.
   2) Use of Programmable calculator & any other electronic instrument prohibited.
   3) Instructions written on main answer book are strictly to be obeyed.
   4) Draw neat diagrams & figures (if necessary) at right places.
   5) Assume suitable & perfect data if needed.
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SECTION-I

Q-1   Attempt the following.

   (a)   Define machine design.   01
   (b)   Differentiate (with neat sketch). Crushing and Transverse shear stress   02
   (c)   Explain the factors influencing the design.   02
   (d)   Specify the factors of safety from Group B for the Components of Group A.   02
         Group A: (1) Boiler Shell, (2) shaft, (3) Key, (4) Bolt, (5) Crane Hook.
         Group B: (1) 2, (2) 3, (3) 5, (4) 12, (5) 10.

Q-2   (a)   State the applications and advantages of riveted joints.   04
      (b)   Explain importance of preferred numbers and preferred series. Also Standardize six   05
            shaft sizes between 40 mm to 200 mm.
      (c)   The axle of a railway wagon is symmetrically situated in bearing. The reaction at the   05
            bearing amounts to 70 kN. If the wheel load is at 250 mm from the bearings, Find the
            diameter of the axle if fibre stress is limited to 80 MPa.
                                          OR
Q-2   (a)   What is factor of safety? Explain basic requirements of Machine elements.   04
      (b)   A Tie bar 15 mm thick has a hole of 30 mm diameter for rivet. If the tie bar is subjected   04
            to pull of 80 kN. Find the width of bar at the centre line of the rivet. Take Allowable
            tensile stress = 65 MPa.
      (c)   A mild steel link is as shown in Fig.1, which is subjected to a tensile load of 80 kN.   06
            Find the b. The permissible tensile stress is 70 MPa. Take t=20 mm.

Q-3   (a)   A plate 75 mm wide and 12.5 mm thick is joined with another plate by a single   07
            transverse weld and a double parallel fillet weld as shown in Fig.2. The maximum
            tensile and shear stresses are 70 MPa and 56 MPa respectively. Find the length of each
            parallel fillet weld, if the joint is subjected to both static and fatigue loading.
      (b)   Design a knuckle joint to transmit 150 kN. The design stresses may be taken as 75 MPa   07
            in tension, 60 MPa in shear and 150 MPa in compression.
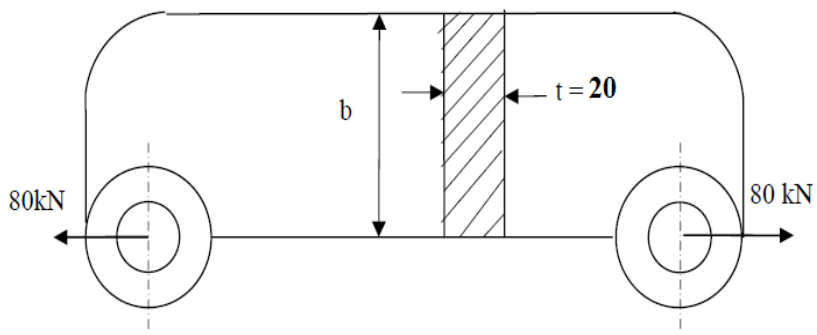   OR

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Q-3 (a) Two plates of 10 mm thickness each are to be joined by means of a single riveted 06 double strap butt joint. Determine the rivet diameter; rivet pitch, strap thickness and efficiency of the joint. Take the working stresses in tension and shearing as 80 MPa and 60 MPa respectively.

(b) Design a gib and cottor joint , to carry a maximum load of 35 kN. Assuming that the 08 gib, cotter and rod are of same material and have the following allowable stresses: Allowable tensile stress = 20 MPa , Allowable crushing stress = 50 MPa, Allowable shear stress = 15 MPa.
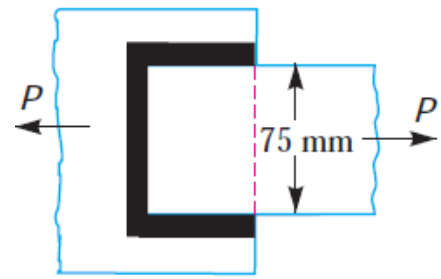
SECTION-II

Q-4 Attempt the following.

(a) According to Indian standard specification, 100 H6/g5 Means_____ 01
(b) Justify: Preloading Improves the fatigue strength of bolted joint. 02
(c) Explain the effect of keyway on the strength of a shaft. 02
(d) Differentiate among a stud, a bolt and a nut. 02

Q-5 (a) Square key is stronger against crushing than rectangular key". Justify the statement 03
(b) Differentiate muff coupling and clamp coupling with neat sketch. 04
(c) A 3-Ø induction motor is directly connected with a centrifugal pump ,Discharge of 07 pump against a head of 10 meters = 25 K lit/min, Maximum torque is 30% more than average torque, Design shear stress = 60 N/mm^2,R.P.M. = 1000,Pump efficiency = 85%,Design the shaft of electric motor, neglecting weight of shaft & coupling

OR

Q-5 (a) What is feather key? Give its applications, advantages and disadvantages over flat key. 03
(b) State & Explain the various criteria on which shaft are designed. 04
(c) Design and draw a protective type of cast iron flange coupling for a steel shaft 07 transmitting 15 kW at 200 r.p.m. and having an allowable shear stress of 40 MPa. The working stress in the bolts should not exceed 30 MPa. Assume that the same material is used for shaft and key and that the crushing stress is twice the value of its shear stress. The maximum torque is 25% greater than the full load torque. The shear stress for cast iron is 14 MPa.

Q-6 (a) Define basic shaft system and hole system of tolerances. 03
(b) Explain any four editing commands of AUTOCAD. 04
(c) A rocker arm of an internal combustion engine has T-Section with flange: 4t *t and web 07 4t*t. A load of 1.75 kN acts at the valve end at the distance of 120 mm from the fulcrum pin axis.If the allowable stress for the forged steel rocker arm is 100 MPa,Find the cross - section of the arm near boss.

OR

Q-6 (a) Define upper deviation, lower deviation and basic size with neat sketch. 04
(b) Explain the machining symbol with all parameter. 03
(c) The lead screw of a lathe has Acme threads of 50 mm outside diameter and 8 mm 07 pitch. The screw must exert an axial pressure of 2500 N in order to drive the tool carriage. The thrust is carried on a collar 110 mm outside diameter and 55 mm inside diameter and the lead screw rotates at 30 r.p.m. Determine (a) the power required to drive the screw; and (b) the efficiency of the lead screw. Assume a coefficient of friction of 0.15 for the screw and 0.12 for the collar.

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Q.2 OR -(c) - Fig.1   Q.3 (a) - Fig.2

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