Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III(OLD) • EXAMINATION – WINTER 2016

Subject Code:131902 **Date:07/01/2017**

Subject Name:Machine Design & Industrial Drafting

Time:10:30 AM to 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)** Answer the following (any TWO) **07**

1) List and explain the factors to be considered while selecting the factor of safety.
2) Discuss the different failures of rivets in a rivetted joint.
3) Explain the morphology of design in detail.

(b) Answer the following (any TWO) **07**

1) Write short note on Selection of materials.
2) Explain the points to be considered while designing the components subjected to bending.
3) What do you mean by stress concentration? Explain any three methods to reduce stress concentration?

Q.2 **(a)** Explain the design of riveted Joints subjected to eccentric loading. **04**

(b) Design a knuckle joint (rod of a circular section) to withstand a tensile force of 25 kN. The design stresses for the rod, knuckle, collar and taper pin in tension, shear and crushing are 60 MPa, 35 MPa and 60 MPa respectively. **10**

OR

(b) Design a simple cotter joint (rod of a square cross section) to withstand a tensile load of 108 kN. The design stresses for all the parts in tension, shear and crushing are 120 MPa, 70 MPa and 240 MPa respectively. **10**

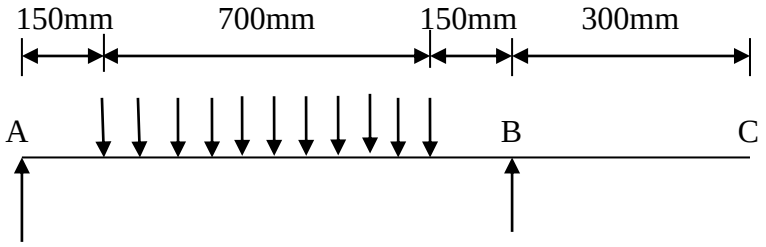
Q.3 **(a)** Design a square and rectangular key (using proportionate dimensions formula) for 100 mm shaft diameter considering the design shear stress as 50 MPa and crushing stress as 80 MPa for shaft material. Compare the strength of both the keys and state which one is stronger. How? **04**

(b) Design a bush pin type flexible flange coupling to connect the output shaft of an electric motor to the shaft of a centrifugal pump. The motor delivers 20 kW power at 720 r.p.m. Consider that the starting torque of the motor is 150 % than the rated torque. Take total no. of pins as 6. The design shear stress for shaft is 95 N/mm^2. The design shear stress and crushing stresses for key are 100 N/mm^2 and 300 N/mm^2 respectively. The design shear and tensile stress for pin are 35 N/mm^2 and 200 N/mm^2 respectively. The design shear stress for C.I. flange is 16.67 N/mm^2. **10**

OR

Q.3 **(a)** Differentiate clearly between flexible coupling and rigid coupling. **04**

(b) The armature shaft of a 40 kW, 720 r.p.m. electric motor is mounted on two bearings A and B as shown in fig below. The total magnetic pull on the armature is 7 kN and is to be assumed uniformly distributed over a length of 700 mm midway between the bearings. A flat belt pulley C, to drive another machine is placed at the distance of 300 mm form bearing B and subjected to vertically downward tensions(tight and slack side) 3000 N and 1000 N. The permissible shear stress for shaft is 103.95 N/mm^2.Calculate the shaft diameter using ASME code if K_b and K_t are 1.5 and 1.0 respectively. **10**



OR

Q.4 **(a)** State the different types of screw threads used in power screw and explain any two of them. (i) Toggle Screw Jack (ii) Carpentry Vice (iii) Lathe Machine **04**

(b) Design a lever loaded safety valve from the following given data: **10**

Valve diameter = 70 mm Blow off steam pressure = 1 N/mm^2

Lever having rectangular cross-section depth to width(thickness) ratio = 4

For lever pin length to diameter ratio = 1.25

The distance from the fulcrum to the weight of the lever = 880 mm

The distance between the fulcrum pin connecting the valve spindle link to the lever = 80 mm

Boss projected by 2 mm on each side at lever fulcrum and bush thickness 2 mm

Stresses for lever and pin materials are as below:

Design tensile stress = 70 MPa Design bearing pressure = 25 MPa

Design shear stress = 50 MPa

OR

Q.4 **(a)** Suggest the suitable screw thread forms used for the following application giving reasons: **04**

(b) Design a simple screw jack (bottle type) from the following data: **10**

Load capacity =100 KN Maximum lift = 500 mm

For the 30C8 steel screw:

S_{uc}=560 Mpa, S_y=300 Mpa, F.O.S = 7

Pitch of thread = 8 mm

For the P-bronze nut : Design bearing pressure = 15 Mpa,

Design tensile stress = 60 MPa,

Design shear stress = 30 MPa

For the C.I body: Design compressive stress =100 Mpa

Co-efficient of friction for screw and nut=0.12

E = 2.1 x 10^5 N/mm² for steel.

Design includes (i) dimensions of screw and nut (ii) Check for stability.

Q.5 **(a)** Why a boss and bush are used at the fulcrum of the levers? Explain with neat sketch. **04**

(b) Answer the following : **10**

1. Explain the roughness symbols and its indication on drawings
2. Explain the following AUTO CAD commands:
   Line, rectangle, mirror, paste.

OR

Q.5 **(a)** Explain hole-based and shaft based limit system with neat sketch. **04**

(b) Answer the following : **10**

1. Explain the fits and tolerance related to production drawing.
2. Explain the following AUTO CAD commands:
   Polygons, scaling, trimming, copy.

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