Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC- SEMESTER–III - EXAMINATION – SUMMER 2017

Subject Code: X31903 **Date:31/05/2017**

Subject Name: Machine Design & Industrial Drafting

Time: 02:30 PM to 05:00 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)** Answer the following (any TWO): **06**

1. Explain the importance of materials selection in design.
2. Define factor of safety. List and explain the factors affecting the selection of factor of safety in detail.
3. Explain the general design procedure used to solve any design problem.

(b) (i) State the advantages and disadvantages of riveted joints over welded joints and draw a neat sketch of riveted joint. **08**

(ii) Explain the bending, bearing and crushing stresses in detail giving suitable examples.

Q.2 **(a)** Explain the basic design considerations made in power screw design with neat sketch. **04**

(b) A bell crank lever is to be designed to raise a load of 5 KN at the short arm end. The arm lengths are –effort arm 500 mm and other arm 200 mm. The permissible stresses for pin materials in shear and tension are 40 MPa and 60 MPa and permissible stresses for lever is 80 MPa in tension. The bearing pressure on the pin is to be limited to 10 MPa. Assume the lever cross section as t x 4t and fulcrum pin length as 1.5 times pin diameter. **10**

OR

(b) Design a straight arm lever of a safety valve. The maximum force at which valve blows is 4931 N. The distance between the fulcrum point and valve is 87.5 mm and the length of lever is 700 mm. The permissible stresses for lever material in shear and tension are 40 MPa and 80 MPa and for pin material in shear and tension are 35 MPa and 60 MPa respectively. The bearing pressure on the pin is to be limited to 15 MPa. Assume the lever cross section as t x 4t and fulcrum pin length as 1.25 times pin diameter. **10**

Q.3 **(a)** Explain any three of types of keys with neat sketches. Write the equations for shear and crushing failure of the key. **04**

(b) Design a protected type rigid flange coupling to connect the output shaft of an electric motor to the shaft of a machine from the following given data: **10**

Power to be transmitted = 16 Kw Speed of motor shaft =1000 r.p.m.

No. of pins = 4

The starting torque of motor can be assumed to be 140 % of the rated torque. The design shear stress is 40 MPa for shaft, key and bolt material. The design crushing stress is 70 MPa for key and bolt material. The design stress in shear for hub is 90 MPa and for flange is 10 MPa.

OR

Q.3 **(a)** State the advantages and disadvantages of a bush pin type (protective flange) flexible coupling. **04**

(b) A line shaft carries two pulleys A and B as shown in fig 1.the diameters of pulleys A and B are 360 mm and 500 mm respectively. The maximum tension in either belt is 2.5 kN and the ratio of tensions for both pulley belt drive is 2.5 : 1. The shaft is made-up of 45C8 steel with an ultimate tensile strength of 630 MPa and yield strength of 380 MPa. Determine the shaft diameter using ASME code if, k_b = 1.5 and k_t = 1.0 Assumed that the pulley is keyed to the shaft. Find the shaft diameter using maximum shear stress theory. **10**

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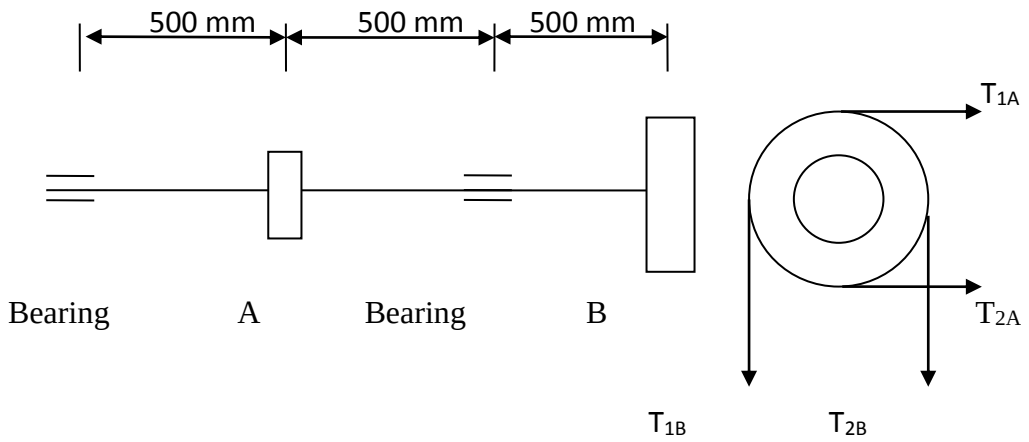

Fig No 1

Q.4 **(a)** Write briefly about following AUTOCAD commands: **04**
Pline, mirror, trim and polygon.

(b) 1. Explain production drawing and its elements in detail. **10**
2. Explain surface roughness indication in drawing.

OR

Q.4 **(a)** Discuss the importance of assembly drawing and explain assembly drawing in detail. **04**

(b) (i) Explain geometric dimensioning and tolerance in detail. **10**
(ii) Draw the drawings of assembly view of Machine Vice.

Q.5 **(a)** How will you increase the life of lever? How will you reduce the maintenance cost of lever at the design stage? **04**

(b) Design a double riveted equal covers butt joint to connect two plates 12 mm thick. Allowable stresses are - in tensile 100 MPa; compressive stress 160 MPa; and shear stress in the rivet 75 MPa. Also find the efficiency of the joint. **10**

OR

Q.5 **(a)** What is Stress Concentration? Explain any three methods of relieving stresses. **04**

(b) Design a Jib and cotter joint to connect two rods – 30 mm x 30 mm square cross-section subjected to tensile load of 108 KN. The permissible stresses are $\sigma_t = \sigma_c$ = 120 MPa , σ_{cr} = 240 MPa and τ = 70 MPa for all parts. **10**

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