

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

## GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA ENGINEERING – SEMESTER –V • EXAMINATION – SUMMER 2015

**Subject Code: 2352002**

**Date: 04 /05 /2015**

**Subject Name: Machine Design**

**Time: 02:30 PM TO 05:00 PM**

**Total Marks: 70**

**Instructions:**

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Each question carry equal marks (14 marks)

- Q.1** (a) State the application of Preferred Number and Standardize 6 speed of 40 mm diameter shaft between 250 RPM to 1400 RPM. **07**
- (b) Define Factor of Safety. State any five factors affecting the Factor of Safety. **07**
- Q.2** (a) A Cotter joint is to resist an axial load of 50 kN. The allowable stresses of joint materials are;  $[\sigma_t]=72 \text{ N/mm}^2$ ,  $[\tau]= 50 \text{ N/mm}^2$ ,  $[\sigma_{cr}]=160 \text{ N/mm}^2$ ,  $[\sigma_b]=150 \text{ N/mm}^2$ . Find (1) Diameter of rod (2) Diameter of enlarged end of spigot (3) Width, thickness and length of cotter. **07**
- (b) Write down equations of any five failures of a Knuckle joint, showing the resisting area by sketch of each. **07**
- OR
- (b) Give the force analysis for square threaded Power screw when load is being lifted. **07**
- Q.3** (a) Define Mechanical Advantage in case of Lever and Explain types of lever with the help of neat sketch of each type. **07**
- (b) A rocker arm has two arms 150 mm and 200 mm in length. The included angle between the arms is  $150^\circ$ . It exerts a maximum load of 3 kN on 150 mm arm. If the allowable stresses are;  $[\sigma_t]=65 \text{ N/mm}^2$ ,  $[\tau]= 40 \text{ N/mm}^2$ ,  $[\sigma_b]= 80 \text{ N/mm}^2$  and  $[P_b]= 10 \text{ N/mm}^2$ . Find (1) Diameter and length of fulcrum pin, if  $L/d_p = 1.25$  (2) cross section of the rocker arm at 80 mm distance from fulcrum, if  $b/t = 3$ . **07**
- OR
- Q.3** (a) With the help of neat sketches, state and explain the equations of possible failures in a riveted joint. **07**
- (b) A double riveted double cover butt joint is used to connect two plates of 12 mm thick. A pitch of the rivet is 60 mm.  $[\sigma_t]=70 \text{ MPa}$ ,  $[\tau]= 55 \text{ MPa}$ ,  $[\sigma_{cr}]=100 \text{ MPa}$ . Find diameter of rivet and strength of riveted joint. **07**
- Q.4** (a) A semi elliptical leaf spring has 12 leaves, in which first two are full length leaves and the remaining are graduated leaves. The span of the spring is 1200 mm and leaves are held together by a central band clip 70 mm wide. Maximum load on the spring is 6 kN. Find maximum deflection of spring when  $b = 4t$ ,  $[\sigma_{bF}]= 300 \text{ MPa}$  and  $E = 2.15 \times 10^5 \text{ MPa}$ . **07**
- (b) Draw the neat sketch of semi elliptical leaf spring showing its various parameters and give the name of material used in leaf spring. **07**
- OR
- Q.4** (a) Explain design of closed coil compression helical spring. **07**
- (b) The maximum internal pressure of  $8 \text{ N/mm}^2$  exerts in a cylindrical pressure vessel having 200 mm external diameter and 12 mm plate thickness. Find hoop Stress and longitudinal stress if joint efficiency is 80%. **07**
- Q.5** (a) Explain types of Rolling contact bearing with figure. **07**

- (b) Design shaft and rectangular key for 15 kW, 900 RPM motor, Take  $[\sigma_c]=150$  N/mm<sup>2</sup>,  $[\tau]=50$  N/mm<sup>2</sup>. **07**

OR

- Q.5** (a) Explain the basic dynamic capacity of a radial ball bearing for getting 10,000 hours rating life. The bearing is running at 500 RPM under 3.5 kN radial load. **07**
- (b) Explain eccentric loading and state at least five machine members subjected to eccentric loading. **07**