

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-III • EXAMINATION – WINTER • 2014

Subject Code: 2130103**Date: 18-12-2014****Subject Name: Analysis of Mechanism and Machine Elements****Time: 02.30 pm - 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) Explain different types of kinematic pairs. State difference between mechanism and machine. **07**
- (b) Explain different inversions of four bar chain mechanism. **07**
- Q.2** (a) Explain stress strain relationship for ductile material. **07**
- (b) A mild steel rod of 15 mm diameter was tested for tensile strength with the gauge length of 75 mm. Following observations were recorded: Final length = 90 mm; Final diameter = 10 mm Yield load = 4.2 kN and Ultimate load = 7.2 kN. Calculate: 1. yield stress, 2. ultimate tensile stress, 3. percentage reduction in area, and 4. percentage elongation. **07**
- OR**
- (b) A shaft is transmitting 120 kW at 110 rpm. Find a suitable diameter for the shaft, if the maximum torque transmitted exceeds the mean by 25 %. Take maximum allowable shear stress as 75 MPa. **07**
- Q.3** (a) Draw velocity diagram for the configuration of four bar chain mechanism as shown in Fig. 1. Find out absolute velocity of point P and rubbing velocity at all the four pins at the points A, B, C and D. **07**
- (b) For the configuration of four bar chain mechanism shown in Fig. 1, find out acceleration of point P. **07**
- OR**
- Q.3** (a) Draw velocity diagram for the configuration of slider-crank mechanism as shown in Fig. 2. Find out absolute velocity of slider S and point P on the connecting rod. **07**
- (b) For the configuration of the slider-crank mechanism shown in Fig. 2, find out acceleration of slider S and point P. **07**
- Q.4** (a) A steel shaft 50 mm diameter and 500 mm long is subjected to a twisting moment of 1100 N-m, the total angle of twist being 0.6° . Find the maximum shearing stress developed in the shaft and modulus of rigidity. **07**
- (b) A hollow shaft is required to transmit 11.2 MW at a speed of 300 rpm. The shear stress allowed in the shaft is 80 MPa and ratio of the inner diameter to outer diameter is $\frac{3}{4}$. **07**
- OR**
- Q.4** (a) A mild steel shaft of 50 mm diameter is subjected to a bending moment of 2000 N-m and a torque T. If the yield point of the steel in tension is 200 MPa, find the maximum value of this torque without causing yielding of the shaft according to the maximum principal stress theory. **07**

- (b) A steel shaft 40 mm in diameter and 1.5 m length held rigidly at one end has a hand wheel 500 mm in diameter keyed to other end. The modulus of rigidity of steel is 80 GPa. Calculate (i) required tangential load to the rim of the wheel to produce torsional shear of 60 MPa, and (ii) angle of twist when this load is applied. 07
- Q.5 (a) Classify different types of riveted joints. And explain why butt joint with single cover is stronger than lap joint for the same plate thickness and riveting configuration. 07
- (b) A double riveted double cover butt joint is made in 12 mm thick plates with 18 mm diameter rivets. Find the efficiency of the joint for a pitch of 80 mm if tensile stress = 100 MPa, shear stress = 80 MPa and crushing stress = 160 MPa. 07
- OR
- Q.5 (a) Define following terms: 07
 (i) spindle (ii) axle (iii) shaft (iv) thin shell pressure vessel (v) thick shell pressure vessel (vi) double riveted joint (vii) caulking and fullering
- (b) A single riveted double cover butt joint is made in 10 mm thick plates with 20 mm diameter rivets with a pitch of 60 mm. Calculate the efficiency of the joint if tensile stress = 115 MPa, shear stress = 80 MPa and crushing stress = 160 MPa. 07


