Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

BE SEM-III Examination May 2012

Subject code: 130103

Subject Name: Analysis of Mechanism and Machine Elements

Date: 08/05/2012 **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 about: **07**

a. Link/element/body b. Kinematic pair

b. Kinematic chain d. Structure

e. Mechanism f. Degree of freedom

(b) Explian: **07**

a. Rigid body b. Resistant body

c. Velocity image d. Centrode

Q.2 **(a)** Explain Grashof's Law. And define class-I and class-II mechanisms. **07**

(b) With help of neat sketch explain Withworth quick return mechanism. **07**

OR

(b) With help of neat sketches explain inversions of four-bar mechanism.

Q.3 **(a)** Fig. 1 shows the link mechanism of a quick return mechanism of the slotted lever type. For the configuration shown determine the velocity of the cutting tool at S and the angular velocity of the link RS. The crank OP rotates at 210 rpm. Take angle OAR $=15^0$. **07**

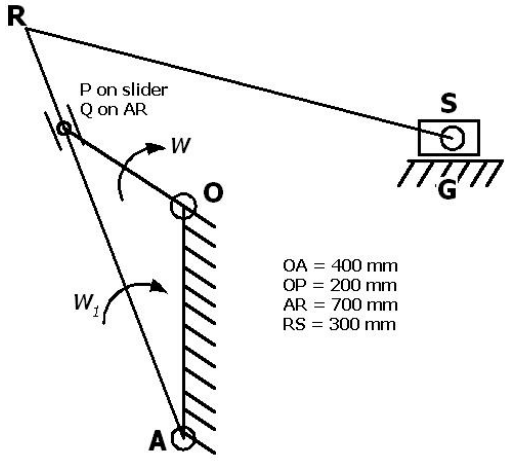

Fig. 1

(b) For the mechanism shown in Fig. 1 (Q-3, a), draw acceleration diagram and find out **07**

the absolute acceleration of slider S.

OR

Q.3 **(a)** Define I-centre and explain Kennedy's theorem. **07**

(b) Explain Klein's construction for slider crank mechanism. **07**

Q.4 **(a)** Briefly explain different material properties. With help of example explain different types of stresses induced in the machine element. **08**

(b) Find the minimum size of a hole that can be punched in a 20 mm thick mild steel plate having ultimate shear strength of 300 N/mm^2. The maximum permissible compressive stress in the punch material is 12000 N/mm^2.A shaft is transmitting 97.5 kW at 180 rpm. If the allowable shear stress in the material is 60 MPa, find the suitable diameter for the shaft. The shaft is not to twist more than 1^o in a length of 3 m. Take C = 80 GPa. **06**

OR

Q.4 **(a)** Classify different types of riveted joint. Explain Caulking and Fullering. **07**

(b) Explain Mohr's circle method to find out principle stresses. And define shaft, axle and spindle **07**

Q.5 **(a)** Find the thickness for a tube of internal diameter 100 mm subjected to an internal pressure which is 5/8 of the value of the maximum permissible circumferential stress. Also find the increase in internal diameter of such a tube when the internal pressure is 90 N/mm^2. Take E = 205 kN/mm^2 and $\mu = 0.29$. Neglect longitudinal strain. **07**

(b) A hollow shaft for a rotary compressor is to be designed to transmit a maximum torque of 4750 N-m. The shear stress in the shaft is limited to 50 MPA. Determine the inside and outside diameter of the shaft, if the ratio of the inside to the outside diameter is 0.4. **07**

OR

Q.5 **(a)** 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 efficiency of the joint if, σ_t = 100 MPa, σ_c = 160 MPa and τ = 80 MPa. **07**

(b) A line shaft rotating at 200 rpm is to transmit 20 kW. The allowable shear stress for the material of shaft is 42 MPa. If the shaft carries a central load of 900 N and is simply supported between bearing 3 m apart, determine the diameter of the shaft. The maximum tensile or compressive stress is not to exceed 56 MPa. **07**