

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013

Subject code: 714701N**Date: 23-12-2013****Subject Name: Concepts in Mechatronics Engineering****Time: 10.30 am – 01.00 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)** Describe Various inversions of four bar chain mechanism and give their applications. **07**
- (b)** Give the advantages and disadvantages of power electronics system. **07**
- Q.2 (a)** i) What is the Degree of freedom of a mechanism? How it is determine? **04**
 ii) Why are parallel-crank four bar linkage and deltoid linkage considered special cases of four-link mechanism **03**
- (b)** Define Base circle , pitch circle , trace point , pitch point , pitch curve , pressure angle and prime circle for cam. **07**
- OR**
- (b)** Derived the relation for power transmission considering effect of initial tension and centrifugal tension then derive condition for maximum power transmission. **07**
- Q.3 (a)** i) What factors are to be considered for selection of material for a machine component? **04**
 ii) What are the three basic modes of failure of mechanical components? Describe **03**
- (b)** i) Describe Reverted gear train. **03**
 ii) Two rods are connected by means of a knuckle joint. The axial force P acting on the rod is 25 KN. The rods and the pin are made of plain carbon steel ($S_{yt} = 380 \text{ N/mm}^2$) and factor of safety is 2.5. the yield strength in shear is 57.7 % of the yield strength in tension. Calculate (i) the diameter of rods and (ii) the diameter of the pin. **04**
- OR**
- Q.3 (a)** i) Compare fluctuating stress, repeated stress and reversed stress. **03**
 ii) What is the difference between failure due to static load and fatigue failure? **04**
- (b)** Give broad classification of gears according to relative positions of their shaft axes. **07**
- Q.4 (a)** Explain the switching on and off characteristics of a SCR. **07**
- (b)** Describe the series operation of SCRs. **07**
- OR**
- Q.4 (a)** Explain single phase rectifier with Resistive load. Draw the necessary waveforms. **07**
- (b)** Draw the waveforms and circuit diagram which explain the operation of 3 phase rectifier with R-L load. **07**
- Q.5 (a)** Explain the 1-phse semi-converter with waveforms. **07**
- (b)** What is DC chopper? Explain the basic step-down chopper. **07**
- OR**
- Q.5 (a)** Describe the two quadrant chopper. **07**
- (b)** Explain the regenerative braking of DC motor. **07**