Enrolment No._____

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?ii) Why are parallel-crank four bar linkage and deltoid linkage considered	04
	(b)	special cases of four-link mechanism Define Base circle , pitch circle , trace point , pitch point , pitch curve , pressure angle and prime circle for cam.	03 07
	(b)	OR 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 (Syt =380 N /mm²) 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 	04
		(11) the diameter of the pin.	
0.3	(a)	i) Compare fluctuating stress repeated stress and reversed stress	03
Z .0	(u)	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
0.4	(a)	Explain the switching on and off characteristics of a SCR.	07
C	(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. OR	07
Q.5	(a)	Describe the two quadrant chopper.	07
	(b)	Explain the regenerative braking of DC motor.	07