Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER 2012

Subject code: 714701 **Date: 08-01-2013**

Subject Name: Concepts in Mechatronics Engineering

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)**	Distinguish between following (1) Mechanism and Machine (2) Kinematics and Dynamics (3) Lower and Higher Pairs	**07**
	(b)	List out the different power electronics switches with their symbol.	**07**
Q.2	**(a)**	How are the cams and cam followers classified? Describe in detail.	**07**
	(b)	(i)Define the relation T1 / T2 = $e^{\mu\theta}$ for a flat belt drive with usual notations.	**04**
		(ii) A casting weighs 6 kN and is freely suspended from a rope which makes 2.5 turns round a drum of 200 mm diameter. If the drum rotates at 40 rpm, determine the force required by a man to pull the rope from the other end of the rope. Also, find the power to raise the casting. The coefficient of friction is 0.25.	**03**
		OR	
	(b)	What is the gear train? Explain with the help of neat sketch main types of gear trains.	**07**
Q.3	**(a)**	(i)Describe basic procedure of design of machine element with the help of flow chart.	**04**
		(ii) What are the factors to be considered for the selection of material for a machine component?	**03**
	(b)	(i) Two horizontal plates subjected to a tensile force of 50 kN, are fixed together by means of 3 rivets in a row. The plates and rivets are made of carbon steel with tensile yield strength of 250 N/mm^2. The yield strength in shear is of 50% of the tensile yield strength and factor of safety is 2.5. Neglect stress concentration factor. Determine (1)the diameter of rivets (2)The thickness of the plates, if width of the plate is 200 mm.	**04**
		(i) Give definition of the following (1) Percentage reduction in area (2) Malleability (3) Resilience.	**03**
		OR	
Q.3	**(a)**	(i)Distinguish between longitudinal, transverse and torsional vibrations. (ii) What do you understand by whirling of shafts? What is whirling or critical speed? Explain.	**07**
	(b)	Define Endurance limit. Explain how it can be determine for (i) a rotating beam specimen and (ii) particular mechanical component subjected to reversed bending stress.	**07**
Q.4	**(a)**	Explain gate triggering methods of SCR.	**07**

	(b)	Explain the stator voltage control of induction motor with diagram.	**07**
		OR	
Q.4	**(a)**	Explain the variable steeper motor control with the diagram.	**07**
Q.4	**(b)**	Explain basic block diagram of firing circuit.	**07**
Q.5	**(a)**	Describe the 1-phase Full wave rectifier with R-L load.	**07**
	(b)	Explain type B chopper.	**07**
		OR	
Q.5	**(a)**	Explain the 3-phase Half wave rectifier with waveforms.	**07**
	(b)	Explain the D.C motor control with 1-phase rectifier in continuous conduction mode.	**07**

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