Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. - SEMESTER – VIII EXAMINATION – OCTOBER 2012

Subject Code: 181702 Date: 29/10/2012

Subject Name: Motion Control

Time: 02.30pm - 05.00pm Total Marks: 70

Instructions:

1. **Attempt any five questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	For rotational motion prove that the inertia is proportional to the fourth power of radius. Derive the relation between the translational and rotational motions.	**07**
	(b)	Why incremental encoders are needs? What are the types of it? Explain each parts of the incremental encoder in details.	**07**
Q.2	**(a)**	What are the advantages and disadvantages of step motors? Explain the step motor performance characteristics in detail.	**07**
	(b)	Explain single stator stack VR step motors with its advantages and disadvantages compare to multi stator stack.	**07**
		OR	
	(b)	How active-suppression driver schemes different from the conventional driver schemes for VR step motors. Explain active-suppression controller scheme for step motors with necessary voltage waveforms.	**07**
Q.3	**(a)**	Derive the expression for displacement and velocity for incremental motion given to viscous friction with inertia load with input voltage e(t)=1 for 0<=t<=1 ; e(t)=0 for 1<=t<=4 ; e(t)=1 for 4<=t<=5 ; e(t)=0 for t>=5. Draw the corresponding waveforms for displacement and velocity.	**07**
	(b)	Give different types of mechanical commutating dc motors according to armature design and explain each. **OR**	**07**
Q.3	**(a)**	Explain the effect of backlash and dead zone in incremental motion. Draw and explain the displacement and velocity waveforms for backlash with low and high friction.	**07**
	(b)	What is torsional resonance? Explain its effect in three-body structure.	**07**
Q.4	**(a)**	Explain linear bidirectional dc servo amplifier operation with its different types.	**07**
	(b)	What are the design conditions for velocity control of dc motor? Explain velocity control systems with current amplifier in detail.	**07**
		OR	
Q.4	**(a)**	Explain bipolar PWM dc motor amplifiers.	**07**
Q.4	**(b)**	Give the difference between the PLL and PLS systems. Derive the linearized model for the phase-locked servo systems.	**07**
Q.5	**(a)**	Draw and explain bidirectional four-phase single and two phase on logic sequencer circuit with waveform of output phase for each pulses.	**07**
	(b)	Explain effect of lead angle in closed-loop control of step motors.	**07**
		OR	
Q.5	**(a)**	What is the stepping and slewing mode operation of step motors? List out the open-loop acceleration and deceleration control scheme for step motors and explain any one of them.	**07**
	(b)	What are the limitations of encoder over waveform sensing control for step motors? Draw and explain typical current waveforms and current-peak detectors.	**07**

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