# 22541

12 03	42: H	5 [our	'S /	7	0 M	arks		Seat	No.								
Instructions – (1)				All Questions are Compulsory.													
				(2)	Answ	er each	next	mair	Que	estic	on (	on a	a n	ew	pag	ge.	
				(3)	Illustr necess	rate your sary.	r ans	wers	with	nea	at s	keta	ches	5 W]	here	ever	
				(4)	Figure	es to the	e rig	ht inc	licate	ful	l1 n	nark	S.				
				(5)	Assur	ne suita	ble d	lata, i	f nec	ess	ary.						
				(6)	Use c Calcu	of Non-p lator is	progra perm	amma nissibl	ble E e.	Elec	tror	nic	Poc	ket			
				(7)	Mobil Comn Exam	le Phone nunication	e, Pa on de Hall.	ger an evices	nd an are	not	othe pe	er E rmi	Elect ssib	tron le i	ic n		
																Ma	rks
1.		Atte	mpt	any	FIVE	c of the	e folle	owing	•								10
	a)	Defi	ne														
		i) Linear and															
		ii) Non-Linear System															
	b)	) Define Poles and Zeros															
	c)	c) State 2 advantages 2 disadvantages of frequency							res	spor	nse.						
	d)	Draw	Draw the response of Proportional and Integral Controller.														
	e)	Draw	v the	e blo	ock dia	igram of	f serv	vo sys	stem.								
	f)	Write	e the	e gei	neralise	ed transf	fer fu	inctio	n of	Typ	be (	) ar	nd	Гур	e 1		

system.g) State any 2 applications of stepper motor.

# 2. Attempt any THREE of the following:

a) Find the transfer function of the R-C network shown in Fig. No. 1.



#### Figure No. 1

- b) Derive the output expression for first order system for unit step input.
- c) Compare AC and DC servo motor.
- d) A unity feedback system has

$$G(S) = \frac{40(S+2)}{S(S+1)(S+4)}$$

Determine:

- i) Type of system
- ii) All static error coefficients

#### 3. Attempt any THREE of the following: 12

- a) Find the state space representation for transfer function  $\frac{C(S)}{R(S)} = \frac{1}{S^2 + S + 1}$
- b) Define damping. State the effect of damping on the response of  $2^{nd}$  order system and draw the response.
- c) Determine the stability using Routh stability Criteria

 $S^3 + 4S^2 + S + 6 = 0$ 

d) Explain the operation of ON / OFF controller. Draw the response.

12

Marks

12

# 4. Attempt any THREE of the following:

- a) Compare open loop and closed loop system. (Any four points)
- b) List the 4 standard test input signals. Draw graphical representation and their Laplace transforms.
- c) Describe the stability of the control system based on the location of poles and zeros. Show the step response of it (graphically)
- d) Compare PI, PD and PID controllers w.rt any four points.
- e) Describe any four frequency response specifications.

# 5. Attempt any TWO of the following:

a) Find out the transfer function of the system shown in Fig. No. 2 using block diagram reduction technique.



#### Figure No. 2

b) The transfer function of a system is given by  $\frac{C(S)}{R(S)} = \frac{100}{S^2 + 5S + 100}$ 

Calculate :

- i) Damped frequency of oscillations
- ii) Peak time  $(t_p)$
- iii) Peak overshoot (% M<sub>p</sub>)
- iv) Settling time  $(t_s)$
- c) Draw the circuit diagram of electronic PID controller. Write down its mathematical equation.

12

12

# 6. Attempt any <u>TWO</u> of the following:

- a) Describe the working of synchro as error detector.
- b) Describe the working of variable reluctance stepper motor.
- c) Draw Bode plot for the system with open loop transfer function given by G(S) H(S) =  $\frac{20}{S(1+2s)}$