Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech.**
PEI4I102

4th Semester Regular / Back Examination 2017-18
CONTROL SYSTEM ENGINEERING
BRANCH : AEIE, EIE, IEE
Time: 3 Hours
Max Marks : 100
Q.CODE : C773

Answer Part-A which is compulsory and any four from Part-B.
The figures in the right hand margin indicate marks.
Answer all parts of a question at a place.

Part – A (Answer all the questions)

Q1 **Answer the following questions: *multiple type or dash fill up type:*** **(2 x 10)**

a) _____ is an electromagnetic transducer that produces an output voltage depending upon the angular displacement.
b) _____motor rotates in steps.
c) _____block represents the transfer function G(s) of a system.
d) Cascade blocks with transfer functions $G_1(s)$ and $G_2(s)$ can be replaced by a single block with a transfer function equal to the _____ of transfer functions of individual blocks.
e) To shift the takeoff point to the right of the block G(s), _____ the takeoff branch by G(s).
f) The closed system has higher _____ than open loop control system; this implies increased speed of response.
g) The necessary condition of stability are _____ of characteristic equation must be real, non-zero and have the same sign.
h) If the roots of the have negative real parts then the response is _____
i) Routh Hurwitz criterion gives number of roots in the _____ half of the s-plane.
j) If the polar plot of a transfer function passes through the critical point (-1,0). Gain margin is _____

Q2 **Answer the following questions: *Short answer type:*** **(2 x 10)**

a) Define transfer function of a system.
b) Define impulse and impulse response.
c) What are the different types of stepper motors?
d) Define: settling time and overshoot.
e) What are the standard test signals of a control system?
f) What are the benefits of feedback?
g) What is meant by steady state error?
h) State the necessary conditions for the stability.
i) For a unity feedback control system with G (s) = K/s(s+4), what is the value of K for which the damping ratio is 0.5.
j) State Cauchy's theorem.

Part – B (Answer any four questions)

Q3	**a)**	What are the types of Control systems? Write the advantages and disadvantages of all the control systems.	**(10)**
	b)	Write Mason's gain formula.	**(5)**
Q4	**a)**	Explain the procedure to draw the signal flow graph from block diagram.	**(10)**
	b)	Explain the advantages and disadvantages of block diagram reduction process over signal flow graph.	**(5)**
Q5	**a)**	What are the time domain specifications? Explain in detail.	**(10)**
	b)	Sketch a typical step response of a 2^{nd} order under-damped system.	**(5)**
Q6	**a)**	Using Routh Hurwitz criterion, determine the stability of a system representing the characteristic equation, $s^5 + s^4 + 2s_3 + 3s + 5 = 0$	**(10)**
	b)	The open loop transfer function of a unity feedback system is given by $G(s) = 1/ [s(1+s)^2]$. Sketch the polar plot and determine the gain and phase margin.	**(5)**
Q7	**a)**	A unity feedback control system has an open loop transfer function $G(s) = k / [s (s^2 + 4s + 13)]$. Sketch the root locus.	**(10)**
	b)	What are the advantages of Bode plot?	**(5)**
Q8	**a)**	Sketch the Bode plot for the following transfer function and determine the system gain k for the gain cross over frequency to be 5 rad/sec. $G(s) = ks^2 / [(1+0.2s)(1+0.02s)]$	**(10)**
	b)	Describe the Nyquist contour and its various segments.	**(5)**
Q9	**a)**	Draw the state model of a linear single-input-single-output system and obtain its corresponding equations.	**(10)**
	b)	State the properties of a state transition matrix.	**(5)**