A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 54303

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

Fourth Semester

Electrical and Electronics Engineering

15UEE403- CONTROL SYSTEMS

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

PART A - (10 x 1 = 10 Marks)

1. A field F is said to be SOLENOIDAL if CO1- R

   (a) CURL F=0 (b) DIV F=0 (c) $\nabla^2 F = 0$ (d) ∫ F.dl = 0

2. In __________electrical signal is converted in to angular motion. CO1- R

   (a)Series motor (b) Generator (c) Servomotor (d) Shunt motor

3. The unit of magnetic flux density is CO2- R

   (a) Henry/m (b) Ampere/m (c) Coulomb/m (d) Tesla

4. For a second-order system with the closed-loop transfer function $G(s) = \frac{9}{S^2+4s+9}$ the settling time for 2-percernt band, in seconds, is CO2- R

   (a) 1.5 (b) 2.0 (c) 3.0 (d) 4.0

5. The Gain Cross Over Frequency is the frequency at which the phase of the open loop transfer function is______________ CO3- R

   (a) 90° (b) Greater than 180° (c) Less than 180° (d) 180°

6. Example of super paramagnetic materials is CO3- R

   (a) iron (b) cobalt

   (c) oxides (d) magnetic tape

7. Location of roots on the imaginary axis makes the system : CO4- R

   (a) Stable (b) Unstable (c) Marginally stable (d) Linear

8. Unit of Poynting vector is CO4- R

(a) VA/m (b) VA (c) VA/m^2 (d) Watt/m

9. If $X(0)$ is initial value, solution of state equation is_________ CO5- R

(a) $A e^{At} X(0)$ (b) $e^{At} X(0)$ (c) $At e^{At} X(0)$ (d) $t e^{At} X(0)$

10. Which mechanism in control engineering implies an ability to measure the state by taking measurements at output? CO5- R

(a) Controllability (b) Observability

(c) Differentiability (d) Adaptability

PART – B (5 x 2= 10Marks)

11. What are synchros? . CO1- R

12. Write the transfer function of lag-lead compensator CO2- R

13. Define Gain margin. CO3- R

14. State Routh stability criterion. CO4- R

15. Give the properties of conductors.. CO5- R

PART – C (5 x 16= 80Marks)

16. (a) Determine the flux of $\vec{D} = r^2 \cos^2 \varphi \, \vec{a}_r + z \sin \varphi \, a\vec{\varphi}$ over the closed surface of the cylinder $0 \le z \le 1$, $r = 0$ to 4. Verify the divergence between them for this case. CO1- App (16)

Or

(b) State and prove Gauss law with applications CO1- App (16)

17. (a) Derive the time response of second order system subjected to unit step and define all the time domain specifications CO2- App (16)

Or

(b) State and prove Ampere's circuital law with applications. CO2- Ana (16)

18.	(a)	The open loop transfer function of a control system with unity feedback is given by $$\frac{10}{s(1+0.02s)(1+0.2s)}$$ Sketch the Bode plot and determine Phase margin and gain margin. Comment on the stability.	CO3- Ana	(16)
		Or		
	(b)	The open loop transfer function of a unity feedback system is given by $G(S) = \frac{1}{S(S+1)(2S+1)}$. Sketch the polar plot and determine the gain margin and phase margin.	CO3- Ana	(16)
19.	(a)	Derive the Poynting vector from Maxwell's equations and explain power of flow.	CO4- U	(16)
		Or		
	(b)	Explain the procedure for the design of the lag compensator based on frequency response approach using bode plot.	CO4- Ana	(16)
20.	(a)	Determine the canonical state model of the system, whose transfer function is $T(S) = \frac{2(S+5)}{(S+2)(S+3)(S+4)}$	CO5- U	(16)
		Or		
	(b)	Analyze the controllability and observability of a linear time invariant system characterized by the state equation, $\begin{bmatrix}\dot{x_1}\\ \dot{x_2}\end{bmatrix} = \begin{bmatrix}-1 & 0\\ 0 & -2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} + \begin{bmatrix}0\\ 1\end{bmatrix}u$ and output equation, $Y(t) = \begin{bmatrix}1 & 2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}$	CO5- U	(16)