



R18 Regulation

Subject code:207BA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech VII Semester Supplementary Examinations, November 2025

ADVANCED CONTROL SYSTEMS

(EEE)

Maximum Marks: 70

Date: 01.12.2025

Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X2M=20 Marks)		Marks	CO	BTL
1	Define Polar Plot.	2M	1	L1
2	Define Nyquist plot	2M	1	L1
3	List different methods for constructing Lyapunov's functions for non-linear systems	2M	2	L1
4	Define asymptotic stability?	2M	2	L1
5	What is singular point?	2M	3	L1
6	What is stable in the large?	2M	3	L1
7	What is saturation? Give an example	2M	4	L1
8	Write the describing function of ideal relay	2M	4	L1
9	What are the advantages of state space analysis	2M	5	L1
10	What is state and state variable?	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	Draw the polar Plot of the open loop transfer function for K=1 and $G(S)H(S)=K/S(S+1)(S+4)$	10M	1	L2
OR				
12	Explain the procedure to design the Lag Compensator using Bode plot	10M	1	L2
13	Determine the stability of the system using Lyapunov method $\dot{x}=Ax$ where $A=\begin{bmatrix} -1 & -2 \\ 1 & -4 \end{bmatrix}$ Find a suitable lyapunov function	10M	2	L2
OR				
14	Check the stability of the system described by $\dot{x}_1 = -x_1 + 2x_1^2x_2$ $\dot{x}_2 = -x_2$ Use variable gradient method	10M	2	L2
15	Describe analytic method of drawing Phase plane trajectory and also write procedure for phase plane trajectory	10M	3	L2
OR				

16	Construct a phase trajectory by delta method for a nonlinear system represented by the differential equation $\ddot{x} + 4 \dot{x} \dot{x} + 4x = 0$ Choose the initial conditions as $x(0) = 1.0$ and $\dot{x}(0) = 0$.	10M	3	L2
17	Determine and sketch the describing function for Dead-Zone nonlinearity OR	10M	4	L2
18	Determine and sketch the describing function for saturation nonlinearity	10M	4	L2
19	a) Explain the state variable and state transition matrix b) Derive the expression for the calculation of the transfer function from the state variables for the analysis of system?	5M 5M	5	L2
	OR			
20	Determine state model of Armature controlled DC Motor	10M	5	L2