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**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_\_

**End Semester Examination – Nov/Dec - 2016**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **11EE219/12EE219/EE259** | **Duration :** | **3 hrs** |
| **Sub. Name :** | **CONTROL SYSTEMS** | **Max. marks :** | **100** |

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| **Q. No.** | **Questions** | **Marks** |
| **PART-A(10X1=10 MARKS)** | | |
| 1. | Write force balance equation of spring, mass and damper. | (1) |
| 2. | State and prove the rule of eliminating a feedback loop. | (1) |
| 3. | Define ramp signal. | (1) |
| 4. | If **τ**=1 then the system is said to be\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. | (1) |
| 5. | What is characteristic equation? | (1) |
| 6. | Name the plots used for open loop systems. | (1) |
| 7. | What is an asymptote? | (1) |
| 8. | What is phase cross-over frequency? | (1) |
| 9. | What is a state model? | (1) |
| 10. | What are phase variables? | (1) |

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| **PART B(5 X 3= 15 MARKS)** | | |
| 11 | Mention the drawbacks of block diagram approach. | (3) |
| 12 | How the system is classified depending on the value of damping? | (3) |
| 13 | List the stability of the system based on location of roots of the characteristics equation in the s-plane. | (3) |
| 14 | What is Nyquist stability criterion? | (3) |
| 15 | What are state variables? Define state of a system. | (3) |

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| **PART C(5 X 15= 75 MARKS)** | | | |
| 16. | Determine the transfer function X(S)/F(S) of the system shown in fig (i)    Fig (i) | | (15) |
| (OR) | | | |
| 17. | Determine the overall transfer function C(s) / R(s) for the system shown below. | | (15) | | |
| 18. | Define the time domain specifications of a second order system. Derive expressions for rise time **tr**and peak time **tp** of second order system for under damped case. | | (15) | | |
| (OR) | | | | |
| 19. | For a unity feedback control system the open loop transfer function. Find, | |  | | |
| a | Position, velocity and acceleration error constants. | (3) | | |
| b | The steady state error when the input is R(S) where **R(s) =** | (12) | | |
| 20. | Sketch the Bode plot for the following transfer function and determine the phase and gain cross over frequencies. | | (15) | | |
| (OR) | | | |
| 21. | The open loop transfer function of a unity feedback system is . Sketch the Polar plot and determine the Gain margin and Phase margin. | | (15) | | |
| 22. | Find the range of K for stability of **S4+2S3+2S2+(3+K)S+K = 0** **,for k>0.** | | (15) | | |
| (OR) | | | |
| 23. | Sketch the root locus of the system, whose open loop transfer function is | | (15) | | |
| 24. | The state variable model of the system is given below. Determine the controllability and observability of the system. | | (15) | | |
| (OR) | | | |
| 25. | Obtain the state model of the system which is given by using phase variable form | | (15) | | |

ALL THE BEST