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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 :** | **12EC220** | **Duration :** | **3 hrs** |
| **Sub. Name :** | **MODERN CONTROL SYSTEMS** | **Max. marks :** | **100** |

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| **Q. No.** | **Questions** | | **Marks** |
| **PART-A(10X1=10 MARKS)** | | | |
| 1. | Name the types of feedback used in closed loop system. | | (1) |
| 2. | In a signal flow graph, a node with all incoming edges is known as -------------- | | (1) |
| 3. | Draw wave form for unit step input. | | (1) |
| 4. | What is the damping ratio value for the following cases?  Undamped case  Underdamped case | | (1) |
| 5. | In a Bode plot for, the slope of the line is ---------------- db/dec. | | (1) |
| 6. | Mention any two frequency domain specifications. | | (1) |
| 7. | If output is bounded for any bounded input is called --------------------- | | (1) |
| 8. | ----------------------- is the formula for calculating centroid. | | (1) |
| 9. | Write general equation for state and output . | | (1) |
| 10. | What is state variable? | | (1) |
| **PART B(5 X 3= 15 MARKS)** | | | |
| 11. | Write Mason’s gain formula and calculate transfer function for the following signal flow graph  X1  X2  X3  G1  -H1  1 | | (3) |
| 12. | Define positional, velocity and acceleration error constant. (1+1+1) | | (3) |
| 13. | Define gain margin and phase margin. | | (3) |
| 14. | Write the transfer function of PI,PD and PID controllers. | | (3) |
| 15. | What are the advantages of state space equation representation? | | (3) |
| **PART C(5 X 15= 75 MARKS)** | | | |
| 16. |  | Write differential equations governing the mechanical system shown in figure. Also draw the force current and force voltage analogous circuit. | (15) |
| (OR) | | | |
| 17. |  | For the following block diagram, find the transfer function . | (15) |
| 18. |  | Derive the Responses of second order system for undamped case and critically damped case when the input is UNIT STEP. | (15) |
| (OR) | | | |
| 19. |  | Consider second order system with following transfer function (5)  Obtain the rise time, peak time, maximum overshoot and the settling time when the system is subjected to unit-step input. | (15) |
| 20. |  | Sketch the Bode plots of the following transfer function.  Determine the gain cross over frequency, phase cross over frequency, Phase Margin and Gain margin. | (15) |
| (OR) | | | |
| 21. |  | Draw polar plot for the following unity feedback control system whose open loop transfer function is given by  Determine the gain margin and phase margin. | (15) |
| 22. | a. | Test the stability of the system with the following characteristic equation by Routh’s test.  s6 + 2s5 + 8s4 + 12s3 + 20s2 + 16s + 16 = 0. | (8) |
| b. | A unit-feedback system is characterized by the open-loop transfer function    Using the Routh criterion, calculate the range of values of K for the system to be stable. | (7) |
| (OR) | | | |
| 23. |  | Sketch the root locus for the open loop transfer function of unity feedback control system given below | (15) |
| 24. |  | Find the Eigen vectors of the given matrix A= | (15) |
| (OR) | | | |
| 25. | a. | Define Controllability and observability. | (4) |
| b. | Write Controllability and observability criterion. | (6) |
| c. | Write state space representation for the following state equation. | (5) |

ALL THE BEST