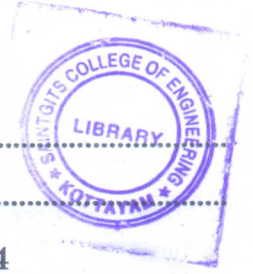


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Reg. No.....

Name.....



B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Fifth Semester

Branch : Mechanical Engineering / Automobile Engineering

MECHATRONICS AND CONTROL SYSTEMS (M, U)

(Old Scheme—Supplementary/Mercy Chance)

[Prior to 2010 Admissions]

Time : Three Hours

Maximum : 100 Marks

Part A

*Answer all questions briefly.
Each question carries 4 marks.*

1. State any *four* properties of operational amplifier, giving their ideal values.
2. What are the advantages of pneumatic system over hydraulic system ?
3. What are the advantages of digital communication compared to analog communication ?
4. What is OCR ? Give its storage and reading principle.
5. Describe a practical closed loop system and an open loop control system.
6. Give the general equation for transfer function of a system and define the following :—
(a) Order. (b) Zeros. (c) Poles.
7. Distinguish between steady state and transient responses of a system.
8. Using Routh's criteria determine how many roots are in the right half of s-plane $s^3 - 4s^2 + s + 6 = 0$.
9. Define gain margin and phase margin with respect to a Bode diagram.
10. What is a polar plot ? Explain the steps of obtaining the polar plot ?

(10 × 4 = 40 marks)

Part B

*Answer all questions.
Each full question carries 12 marks.*

11. What is modulation ? What is its need ? Explain different kinds of modulation bringing out their important features.

Or

12. Describe different types of control valves and their fields of applications.

Turn over



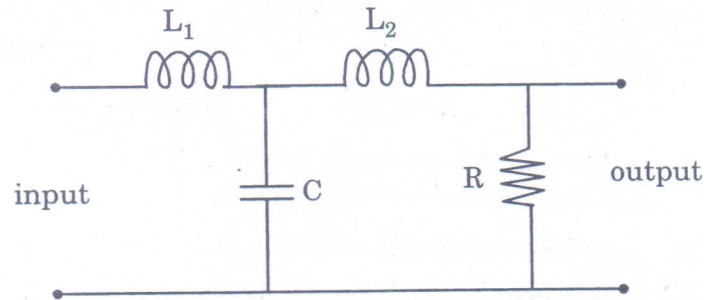
13. What are programmable Logic controllers ? Explain their principle, with the help of necessary diagrams.

Or

14. Explain, with necessary diagrams, the method of data storage and retrieval from :

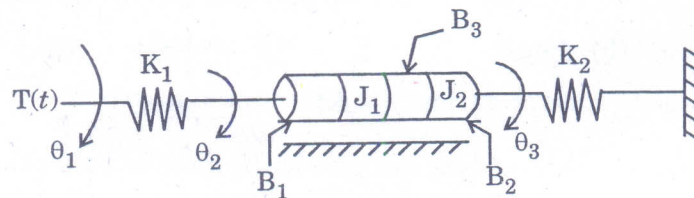
(a) DVD. (b) ROM. Compare their performances.

15. Determine the transfer function of the system shown below :—



Or

16. Obtain transfer function of the rotational mechanical system shown below :



17. A second order system has a transfer function $\frac{25}{s^2 + 6s + 25}$. Find its rise time, peak time, peak overshoot and settling time if subjected to unit step input. Also calculate expression for its output response.

Or

18. (a) For a unity feedback system whose open-loop transfer function is $G(s) = \frac{50}{(1 + 0.1s)(1 + 2s)}$.

Find the position, velocity and acceleration error constants.

(6 marks)

- (b) Find the steady state error and error constant for unit step input of the system

$$G(s) = \frac{40}{s(s+2)(s+4)}, H(s) = \frac{1}{s}$$

(6 marks)

19. The closed loop transfer function of a system is $T(s) = \frac{K}{s^4 + 6s^3 + 30s^2 + 60s + K}$.

- (a) Determine the range in which K must lie for which the system is to be stable.
(b) What should be the upper limit on K if all the poles of T(s) are required to lie on the left on the line $\sigma = -1$?

Or

20. Sketch the root locus of the open-loop transfer function $G(s) = \frac{K(s+2)}{(s+3)^2(s^2+2s+17)}$ comment on

the stability.

[5 × 12 = 60 marks]

