EPCET LIBRARY BANGALORE-49

CBCS SCHEME

USN | | | | | | | | | | |

21ME72

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026
Control Engineering

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Distinguish between Open loop and Closed loop systems. **(05 Marks)**

b. List the types of controllers and explain PID controller with block diagram. **(09 Marks)**

c. List and explain requirements of an ideal control system. **(06 Marks)**

OR

2 a. Obtain the transfer function for an Armature Controlled DC - motor. **(10 Marks)**

b. Obtain the transfer function for the mechanical system shown in Fig. Q2(b). **(10 Marks)**

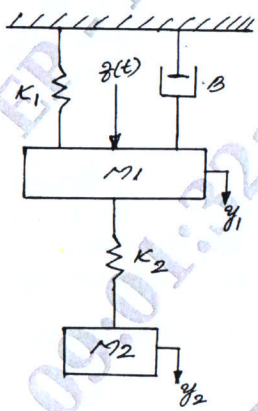

Fig. Q2(b)

Module-2

3 a. Explain typical test signals in control system. **(08 Marks)**

b. Develop an expression for steady state error for a simple closed loop control system. **(08 Marks)**

c. Explain the importance of response analysis of control system. **(04 Marks)**

OR

4 a. Examine a second order under damped system subjected to unit step input. **(10 Marks)**

b. A unity feedback control system is characterized by an open loop transfer function $G(s)\,H(s) = \frac{K}{s(s+10)}$. Determine the system gain K, so that the system will have a damping ratio of 0.5. For this value of K. Find the rise time , settling time and peak over shoot for a unit step input. **(10 Marks)**

Module-3

5 a. Explain the block diagram reduction rules to obtain system transfer function. **(05 Marks)**

b. Obtain the overall transfer function $\frac{C(s)}{R(s)}$ using block diagram reduction technique for the Fig. Q5(b). **(15 Marks)**

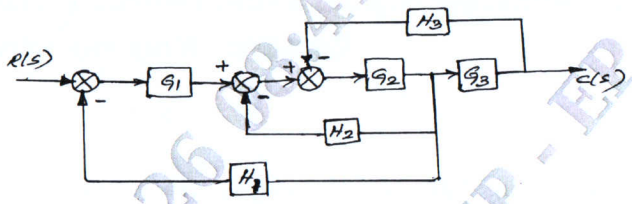

Fig. Q5(b)

OR

6 a. Explain the terms : i) Node ii) Input node iii) Branch iv) Path v) Loop. **(05 Marks)**

b. Find the overall transfer function by using Mason's gain formula for the signal flow graph shown in Fig. Q6(b). **(15 Marks)**

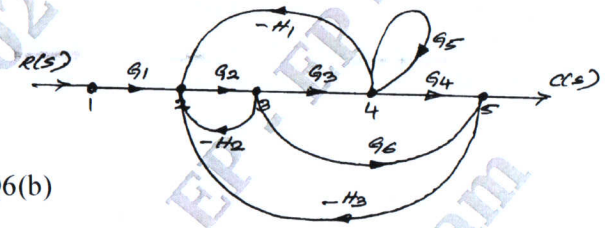

Fig. Q6(b)

Module-4

7 a. The characteristic equation of a system, is given be $s^6 + 3s^5 + 4s^4 + 6s^3 + 5s^2 + 3s + 2 = 0$. Determine the stability using RH criteria. **(06 Marks)**

b. Sketch the root locus plot of a unity feedback with an open loop transfer function

$$G(s) = \frac{K}{s(s+2)(s+4)}$$. Find the value of 'K' for stable. **(14 Marks)**

OR

8 Sketch the root locus plot for the system whose open loop transfer function is given by

$$G(s)\,H(s) = \frac{K}{s(s+2)(s^2+8s+20)}$$. **(20 Marks)**

Module-5

9 Draw the Nyquist plot for

$$G(s)\,H(s) = \frac{K}{s^4+8s^3+17s^2+10s)}$$ and find the value of K. **(20 Marks)**

OR

10 Construct the Bode plot on a semi – log graph paper for a unity feedback system , whose open loop transfer function is given by

$$G(s)\,H(s) = \frac{10}{s(1+s)(1+0.02s)}$$. From the Bode plot, determine

a. Gain and phase cross over frequencies
b. Gain and phase margin.
c. Stability of the closed loop system. **(20 Marks)**

* * * * *