VIT

Reg. No. :

Final Assessment Test (FAT) - APRIL/MAY 2023

Programme	B.Tech	Semester	Winter Semester 2022-23
Course Title	CONTROL SYSTEMS	Course Code	BECE302L
Faculty Name	Prof. Ralph Samuel Thangaraj	Slot	C1+TC1
		Class Nbr	CH2022235000487
Time	3 Hours	Max. Marks	100

PART A (5 X 8 Marks)
Answer All questions

01. What is meant by feedback in the control system? Please discuss the effect of feedback on time constant, and the sensitivity of closed-loop systems. [8]

02. Let's consider a transfer function Y(s)/X(s) as shown in Figure.1. Prove that the system transfer function has a zero in the right of the s-plane. Obtain y(t) when x(t) is a unit step function. [8]

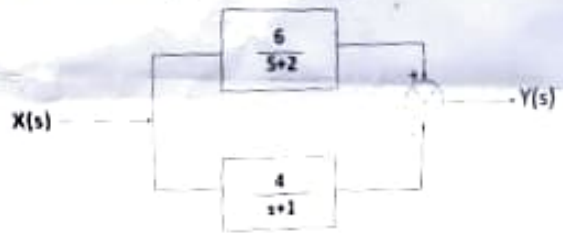

Figure 1

03. For a unity feedback control system, the forward path transfer function is given by [8]

$G(s) = \frac{20}{s(s+2)(s^2+2s+20)}$

Determine the steady-state error of the system, when the inputs are

(i) 5 (ii) 5t (iii) $3t^2/2$

04. Sketch the polar plot for the given transfer function $G(s) = \frac{200(s+2)}{s(s^2+10s+100)}$ [8]

05. A closed-loop control system with unity feedback is illustrated in Figure.2, where R(s) is the input and C(s) is the output in the Laplace domain. By using derivative control, the damping ratio is made to be 0.7. Determine the value of T_d (derivative time), and also determine the rise time, peak time, and maximum overshoot without derivative control. [8]

Figure 2

PART B (4 X 15 Marks)
Answer All questions

06. Determine the closed-loop system transfer function by using Mason's gain formula of the block diagram shown in Figure.3 [15]

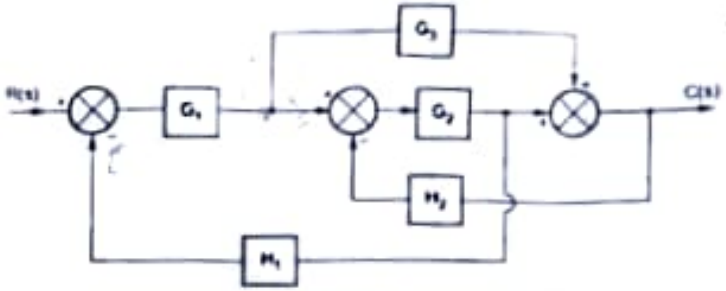

Figure 3

07. An open-loop sytem with a unity feedback is represented by $G(s) = \frac{K}{s(s+3)(s+8)}$ [15]

Draw the root locus, and determine the range of 'K' for the system to be stable.

08. A unity feedback control system has $G(s)H(s) = \frac{10}{s(s+2)(s+20)}$ [15]

Obtain semi-log magnitude and phase plot. Determine Gain margin, Phase margin, gain crossover frequency, and phase crossover frequency.

09. A system is characterized by the transfer function $\frac{Y(s)}{U(s)} = \frac{2}{s^3+6s^2+11s+6}$ [15]

Find the state and output equations in the matrix form and also, test the controllability and observability of the system