No. of Printed Pages : 4

BIEE-021

B.Tech. – VIEP – ELECTRICAL ENGINEERING (BTELVI)

00696

Term-End Examination

June, 2015

BIEE-021 : CONTROL SYSTEMS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. All questions carry equal marks. Use graph wherever required. Semi log paper will be provided. Use of scientific calculator is allowed.*

1. (a) Derive the system equation for Figure 1 and find the value of $X_2(s)/F(s)$. Draw its free body diagram also. *8*

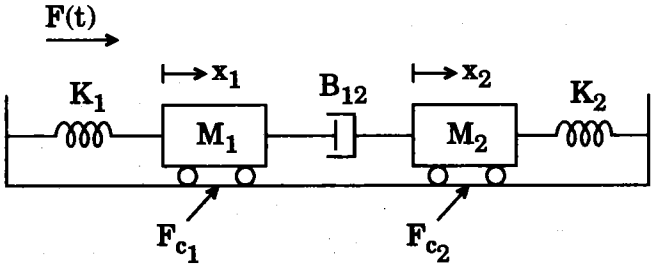

Figure 1

(b) Write the differential equation and its transfer function for Figure 2 as given below : *6*

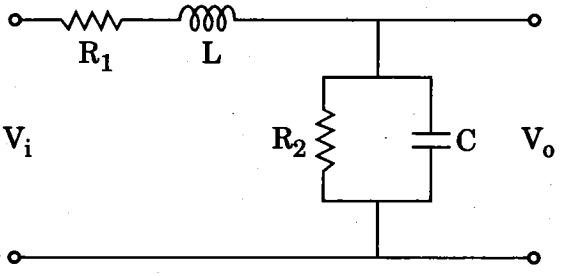

Figure 2

2. (a) A block diagram is shown below in Figure 3. Draw its signal flow graph and determine the transfer function. *10*

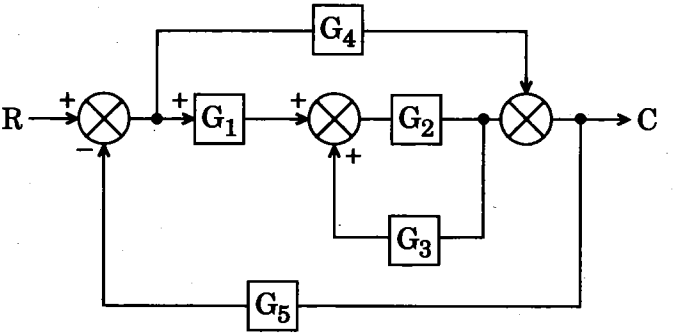

Figure 3

(b) What is a transfer function ? Define the impulse response of a linear system. *4*

3. Determine the overall gain of the signal flow graph given in Figure 4 and also determine y_2/y_1, y_4/y_1 and y_6/y_1. *14*

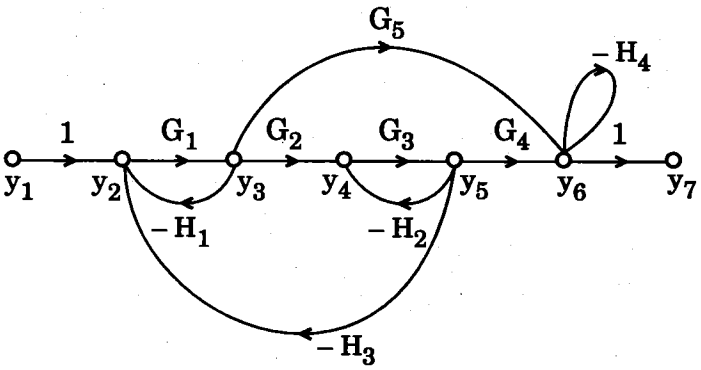

Figure 4

4. The open loop transfer function of a unity feedback system is given by

$$G(s) = \frac{K}{s(1 + sT)},$$

where K and T are positive constants. By what factor should the amplifier gain be reduced so that the peak overshoot of unit step response of the system is reduced from 75% to 25% ? *14*

5. The forward path transfer function of a unity feedback system is given by $G(s) = \frac{K}{s(s + 4)(s + 5)}$. Sketch the root locus as K varies from 0 to ∞. *14*

6. Sketch the Bode plot for the transfer function $G(s) = \frac{1000}{s(1 + 0{\cdot}1s)(1 + 0{\cdot}001s)}$. Comment on the stability of the system. *14*

7. Draw the state block diagram for the transfer function given below : *2×7=14*

(a) $\frac{C(s)}{R(s)} = \frac{1}{s(s+1)(s+3)}$

(b) $\frac{C(s)}{R(s)} = \frac{2s+1}{s^2+2}$

8. Write short notes on the following : *4×3 $\frac{1}{2}$ =14*

(a) PID Controllers

(b) Nyquist Stability Criterion

(c) Lag and Lead Compensator

(d) Hydraulic and Pneumatic System