| BIEE-021 |

B.Tech. IN ELECTRICAL ENGINEERING

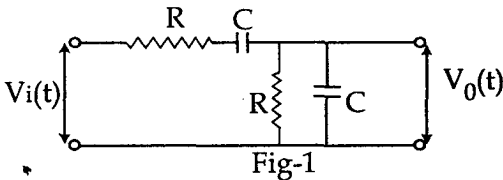## Term-End Examination

December, 2013

BIEE-021 : CONTROL SYSTEM

Time : 3 hours *Maximum Marks : 70*

*Note : Attempt **any five** questions. Each question carry **equal** marks.Use of scientific calculator and graph papers are permitted.*
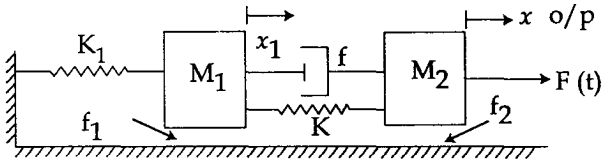
1. (a) Find the transfer function of the network shown in fig. 1. Plot its poles and zeros for R=C=1. **7**

Fig-1

(b) Draw signal flow graph for the equation **7**

$$\frac{d^2y}{dx^2} + \frac{2}{3}\frac{dy}{dx} + \frac{11}{2}y = x$$

2. (a) Obtain the transfer function of the mechanical system shown in fig.2. **7**

Fig-2

(b)   Are the two systems given in fig.3(a),(b)   **7**
      equivalent. If not then prove so :
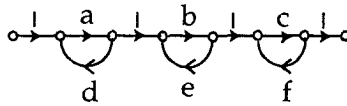

Fig-3(a)

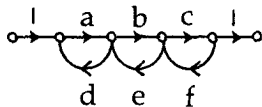

Fig-3(b)

3.   (a)   A unity FB system is characterised by an   **7**

           open loop transfer function $G(S) = \dfrac{K}{S(S+10)}$.

           Determine Gain K so that $\xi = 0.5$. Also
           determine t_s, M_p and t_p for a unit step input.

     (b)   Differentiate between :   **7**

           (i)   Open loop and closed loop control
                 system.

           (ii) Regulator and tracking control

4.   Determine the open loop transfer function of a   **14**
     system whose approximate plot is shown in fig.4.
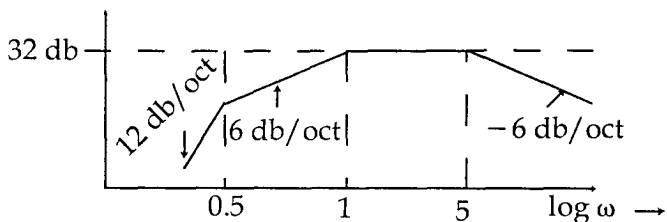

Fig - 4

5. Consider a matrix A given below find the eigen values, eigen vector, modal matrix and diagonalise it. **14**

$$A = \begin{pmatrix} 0 & 1 & 0 \\ 3 & 0 & 2 \\ -12 & -7 & -6 \end{pmatrix}$$

6. Write short note on following : **2x7=14**
   (a) Frequency domain specifications
   (b) Routh-Hurwitz stability criteria

7. (a) Sketch the polar plot of $G(S) = \dfrac{1}{S(1+ST)}$. **7**

   (b) Determine the range of K such that **7** feedback system having characteristic equation
   $S(S^2 + S + 1)(S + 4) + K = 0$

8. Define *any four* of the following : **4x3.5=14**
   (a) Gain Margin and Phase Margin
   (b) PID Controller
   (c) Synchros
   (d) Mason's Gain Formula
   (e) Pneumatic Controller