Total No. of Questions : 10] [Total No. of Printed Pages : 3

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EX–402

B. E. (Fourth Semester) EXAMINATION, Dec., 2011

(Electrical & Electronics Engg. Branch)

ELECTRICAL AND ELECTRONIC MATERIALS

(EX–402)

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt any *two* parts from each Unit. All questions carry equal marks.

Unit–I

1. (a) Discuss the relative merits and demerits of aluminium used as electric conductor instead of copper. 10

   (b) What are the important characteristics and requirements of the various groups of resistor materials based on their practical application ? 10

Or

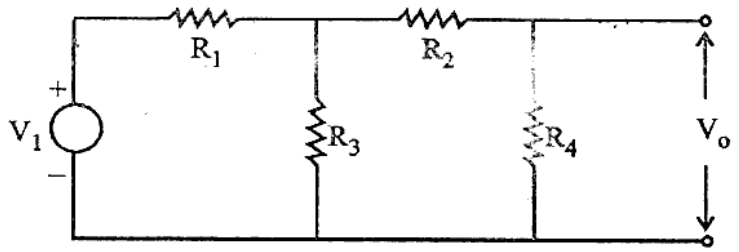
2. (a) What material is used for the element of electrical heaters ? What are the properties the material must possess for this use ? 10

   (b) Discuss MHD generator giving greater emphasis on the material used in it. 10

P. T. O.

Or

Draw the signal flow graph for the following network and then determine the transfer function.



Unit – II

2. The following expression denotes the time response of a servomechanism :

$$c(t) = 1 + 0{\cdot}2\,e^{-60t} - 1{\cdot}2\,e^{-10t}$$

(i) Obtain the expression for the closed loop transfer function of the system.

(ii) Determine the undamped frequency and damping ratio. Assume unit step input.

Or

For unity feedback system having :

$$G(s) = \frac{s(s+1)}{s^2(s+3)(s+10)}$$

determine type of system, error coefficients and the steady state error for input :

$$r(t) = 1 + 3t + \frac{t^2}{2}$$

Unit – III

3. Consider the following characteristics equation :

$$s^4 + Ks^3 + s^2 + s + 1 = 0$$

Determine the range of 'K' for stability.

Or

Draw the root locus of the unity feedback system whose open loop transfer function is :

$$G(s) = \frac{K(s+4)}{s(s+5)(s^2+5s+25)}$$

Find the value of 'K' for stability.

Unit – IV

4. Consider a unity feedback system having transfer function :

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

whose velocity constant has to be $10\,\text{sec}^{-1}$ and the phase margin should be 40°. Design a compensating circuit to meet these requirements.

Or

Design a PID controller for a unity feedback system whose open loop transfer function is :

$$G(s)\,H(s) = \frac{100}{(s+2)(s+3)(s+5)}$$

so that the phase margin of the system will be 45° at 4 rad/sec. and steady state error will be 10% for unit ramp input.

Unit – V

5. Obtain the time response $y(t)$ of the following system :

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix} = \begin{bmatrix}-1 & -0{\cdot}5\\ 1 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} + \begin{bmatrix}0{\cdot}5\\ 0\end{bmatrix}u, \begin{bmatrix}x_1(0)\\ (x_2(0)\end{bmatrix} = \begin{bmatrix}0\\ 0\end{bmatrix}$$

and $y = [1 \quad 0]\begin{bmatrix}x_1\\ x_2\end{bmatrix}$.

Or

Explain in detail the concept of observability and controllability.