2011

M.Sc.

3rd Semester Examination

ELECTRONICS

PAPER—ELC-302

Full Marks : 50

Time : 2 hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

(Control System and Instrumentation)

Answer *Q. No. 1* and any *three* questions from the rest.

1. Answer the following questions : 5×2

(a) For the system having

$$G(s)\,H(s) = \frac{s+2}{(s+1)(s^2+5s+2)}$$

Find the characteristics equation.

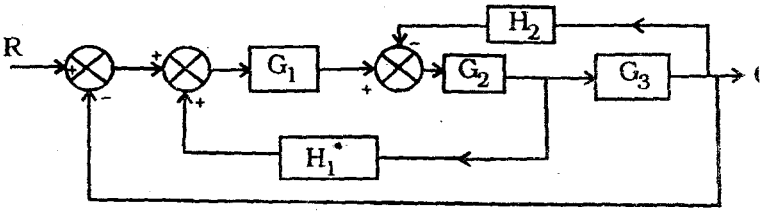
(b) Find the Z-transfom of e^{at} using basic principle.

(c) What is PID controller ?

(d) What are the advantages of feedback network in a control system ?

(e) Define the terms : 'Gain Margin' and 'Phase Margin' related to the stability of the system.

2. (a) Reduce the blocks by using Block diagram method



Also find the transfer function.

(b) A system is described by following equations :

$X_2 = 2X_1 + X_3 + 2X_4 + X_5$

$X_3 = 3X_2$

$X_4 = 4X_3 + 2X_1$

$X_5 = 2X_3 + 2X_4 + 2X_5$

where X_1 is the input node and X_5 is the output node.

(i) Draw the complete signal flow graph.

(ii) Determine the overall gain of the system.

5+5

3. (a) Draw the Bode-plot for the system given by

$$H(s) = \frac{10\,(s+2)}{(s+1)(s+3)}$$

(b) For the OPAMP circuit as shown below, find the output voltage V_0.

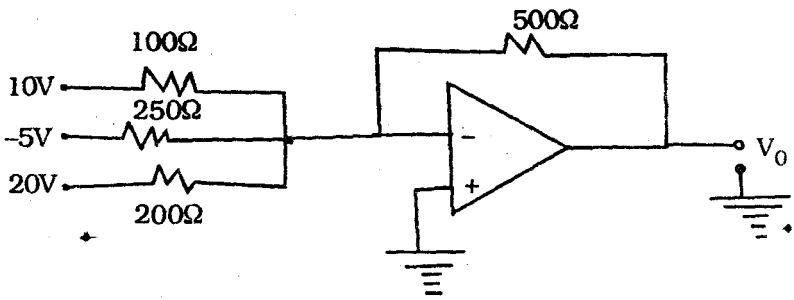


Fig 3(b)

7+3

4. (a) For the closed loop control system as shown in Fig Q.4, determine the value of 'K' and 'a' such that the system has a damping ratio of 0·7 and undamped natural frequency of 4 rad/s.

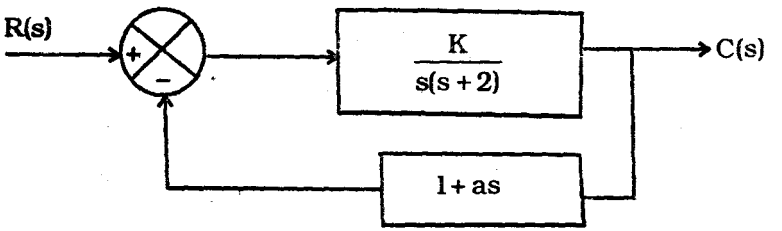


Fig 4

(b) Draw the labelled block diagram model of a Cathode Ray tube.

(c) The characteristics equation of a system is given by :

$$q(s) = s^4 + 8s^3 + 18s^2 + 16s + 5$$
$$= 0$$

Test, using Routh stability criteria, whether the system is stable or not. 4+2+4

5. (a) What is the function of spectrum analyser ? State its field of application. State its frequency range o operation. Draw the labelled block diagram model o a basic spectrum analyser.

   (b) What is wave analyser ? State its field of application Classify the wave analyser on the basis of range o frequency operation.

   Draw labelled block diagram model of any wav analyser. (1+1+1+2)+(1+1+3

6. (a) Explain with block diagram, the working principle o an audio frequency function generator. State its fiel of application.

   (b) Write down the difference between the microwav and millimetre wave radio frequency wave analyse

   (c) What is distortion analyser ? State the types o distortion occur in the output signals of an amplifie with reasons. 4+2+

[Internal Assessment — 10]