C 58361 (Pages : 2) Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2009

EC 04 603—CONTROL SYSTEMS

(2004 admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

1. (a) Explain the basic ideas of functions of complex variables.

(b) Explain the advantages and applications of signal flow graphs.

(c) Obtain the relationship between damping ratio and the amount of overshoot for a second order system.

(d) Explain the concept of feedback in a control system.

(e) Explain the procedure for mapping between S plane and Z plane.

(f) State and explain Jury's Criterion.

(g) Define and explain State Space Analysis.

(h) State and derive initial and final value theorem of Laplace transform.

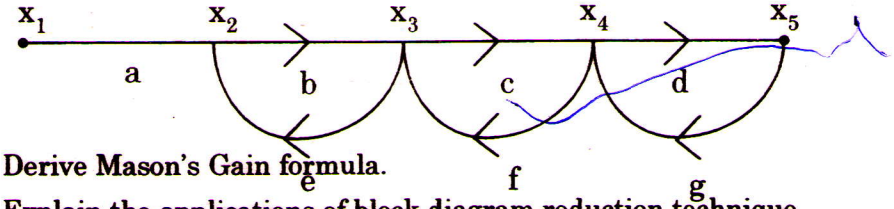
(8 × 5 = 40 marks)

2. (a) (i) Draw the general schematic diagram of a control system and explain it in detail. (7 marks)

(ii) Differentiate open-loop from closed-loop systems. (8 marks)

Or

(b) For the signal flow graph shown in figure, find the loop gain $A = \frac{x_5}{x_1}$.



3. (a) (i) Derive Mason's Gain formula. (7 marks)

(ii) Explain the applications of block diagram reduction technique. (8 marks)

Or

(b) Determine analytically the gain margin and phase margin for the function :

$$GH(s) = \frac{5}{s\left(1+\frac{s}{2}\right)\left(1+\frac{s}{6}\right)}.$$

Turn over

4. (a) State and derive all the properties of z-transform.

Or

(b) (i) Explain the stability analysis after bilinear transformation with an example. (7 marks)

(ii) Apply Routh's Hurwitz criterion to test the stability of the following equation :

$$s^4 + 4s^3 + s + 10 = 0.$$

(8 marks)

5. (a) (i) Define and explain : (1) State. (2) State variable. (3) State vector. (4) State space. (7 marks)

(ii) Explain about SISO system in detail. (8 marks)

Or

(b) (i) Obtain the relation between transfer function and transfer matrix. (7 marks)

(ii) Explain the properties of state transition matrix. (8 marks)

[4 × 15 = 60 marks]