

**Total Number of Pages: 02** 

M.TECH. EEPE204

## 2<sup>nd</sup> Semester Back Examination 2016-17 ADVANCED CONTROL SYSTEMS

BRANCH: ELECTRI & ELECTRONIC ENGG (POWER SYSTEM ENGG), ELECTRICAL POWER SYSTEM, POWER ELECTRONIC, POWER ELECTRONIC & DRIVES, POWER ELECTRONIC AND ELECTRICAL DRIVES, POWER SYSTEM ENGG, POWER SYSTEMS

Time: 3 Hours Max Marks: 70 Q.CODE:Z798

Answer Question No.1 which is compulsory and any five from the rest.

The figures in the right hand margin indicate marks.

Q1 Answer the following questions:

 $(2 \times 10)$ 

(5)

a) Obtain the state-space representation of the following pulse-transfer function in controllable canonical form

$$\frac{Y(z)}{U(z)} = \frac{z^{-1} + 2z^{-2}}{1 + 4z^{-1} + 3z^{-2}}$$

b) Comment on the state controllability of the pulse transfer function

$$\frac{Y(z)}{U(z)} = \frac{z + 0.2}{(Z + 0.8)(z + 0.2)}$$

Give reasons for your answer

- c) What do you understand by deadbeat response? Can the concept of deadbeat control be applied to continuous-time systems?
- d) What do you mean by a state estimator? Differentiate between a full-order and a reduced order observer
- e) State the Quadratic optimal regulator control problem and define the terms used in the expression.
- f) Determine variation of the functional

$$v = \int_0^1 2(x(t) + 2)^2 dt$$

- g) What do you mean by 'sliding surface'?
- h) Explain the term 'Supremum of a transfer function.'
- i) What are the various T-norm and T-conorm operators?
- i) For the fuzzy relation R,

$$R = \begin{bmatrix} 0.9 & 1.0 & 0 \\ 0.35 & 0.01 & 0.3 \\ 0.4 & 0.02 & 0.47 \\ 0.6 & 0.8 & 0.4 \\ 0.1 & 0 & 0.23 \\ 0.68 & 0.72 & 0.05 \end{bmatrix}$$

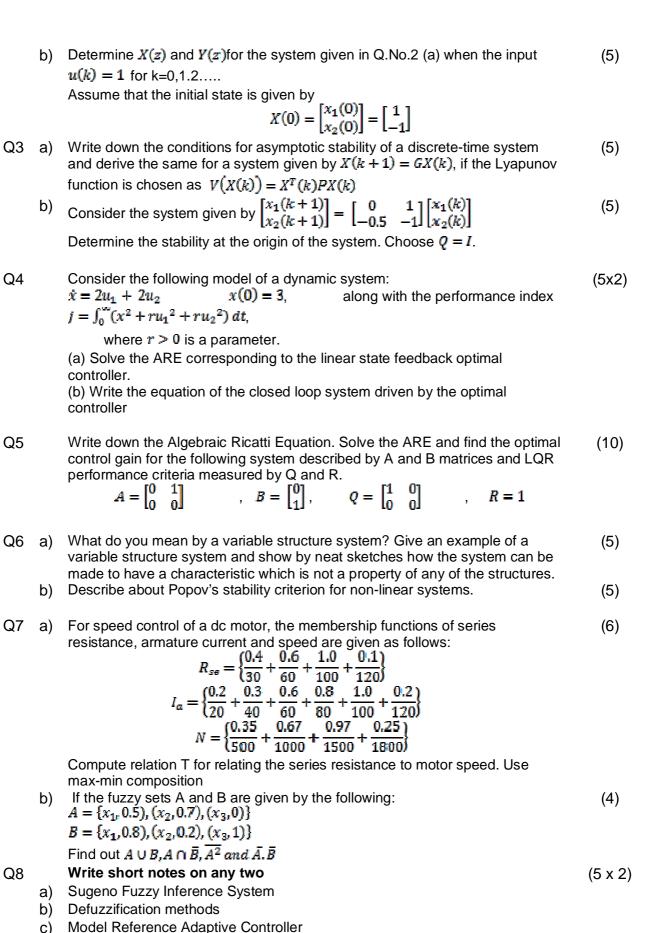
Find the strong  $\lambda$ -cut set relation for  $\lambda$  =0, 0.4.

Q2 a) Obtain the state transition matrix of the following discrete time system.

$$X(k+1) = GX(k) + HU(k)$$

$$Y(k) = CX(k)$$

$$G = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix} , \qquad H = \begin{bmatrix} 1 \\ 1 \end{bmatrix} , \qquad C = \begin{bmatrix} 1 & 0 \end{bmatrix}$$



Self-tuning Regulator

d)