S.E. ETRX Sem III (Old) 2/6/16.

Control Systems

QP Code : 28820

(3 Hours) [Total Marks : 100]

N.B.: (1) Question No. 1 is **compulsory.**
(2) Attempt any **four** out of remaining six.
(3) Assume suitable data wherever necessary.
(4) Figures to the right indicate marks.

Q.1) Attempt any **four** from the following - (20)

a) With suitable example, show how to find GM and PM from polar plot?
b) Show the pole locations for second order system with damping ratio $0 < \xi < 1$.
c) Differentiate between Open Loop and Close Loop system.
d) State the two conditions on which Root Locus is based.
e) Define corner frequency and explain its significance.

Q.2)

a) Find the transfer function of the block diagram shown in figure 1 by using Block diagram reduction method. (10)

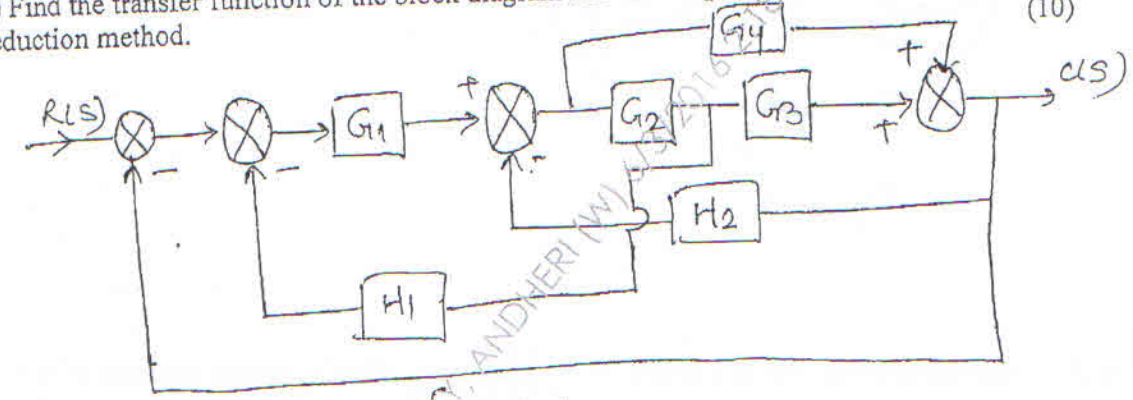


Figure 1.

b) Examine the stability by Routh's criterion of the system whose characteristic equation is (10)

$$s^7 + 2s^6 + s^5 + 2s^4 - s^3 - 2s^2 - s - 2 = 0$$

Q.3

a) Derive an expression for the time response of an under damped second order system subjected to unit step input. (10)

b) The open loop transfer function of a unity feedback system is given by,

$$G(s) = \frac{242(s+5)}{s(s+1)(s^2+5s+121)}$$

Sketch the Bode plot. Find GM and PM. Comment on stability. (10)

Q.4

a) Determine the root locus of the system with

$$G(s) = \frac{K}{s(s^2+2s+2)} \quad \text{and} \quad H(s) = 1. \qquad (10)$$

b) Find the steady state error for various types of standard test inputs (step, ramp and parabolic) for a unity feedback systems with

$$G(s) = \frac{K}{s(s+5)(s+10)}$$ a) K=10, b) K=200 (10)

Q.5

a) Obtain the state transition matrix for a given system matrix $A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$ (10)

b) Draw the signal flow graph and find the transfer function of the system shown in figure 2. (10)

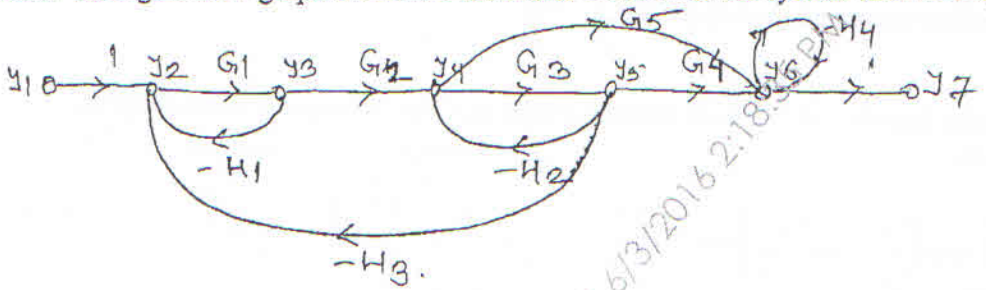


Figure 2.

Q.6

a) The close loop transfer function of a system is $\frac{10}{s^2+2s+10}$. Obtain the time response of the system when a step of 10 Volt is applied at the input terminals of the system. Sketch the response. (10)

b) Sketch the polar plot and discuss the stability of the system represented by -

$$G(s).H(s) = \frac{K}{s(s+1)(s+5)} \qquad (10)$$

Q.7. Write short note on any **two** from the following: (20)

a) Synchro transmitters-receivers

b) Correlation between time domain and frequency domain

c) Different continuous composite controllers

Sem III (old) ETRX 12/05/16

Engg Math Sem III (OLD) ETRX

QP Code : 28659

Time : 3 hours Marks : 100

Note : - 1) Question number 1 is compulsory.

2) Attempt any four questions from the remaining six questions.

3) Figures to the right indicate full marks.

Q1 a) Evaluate $\int_0^\infty \frac{cos6t-cos4t}{t}\,dt$ 5

b) Find the Fourier series for f(x)= $1-x^2$ in -1<x<1 5

c) Show that A = $\frac{1}{3}\begin{bmatrix} -8 & 4 & 1 \\ 1 & 4 & -8 \\ 4 & 7 & 4 \end{bmatrix}$ is orthogonal .Also find its inverse. 5

d) Show that the functions $\bar{z}$ & $\frac{z}{\bar{z}}$ are not analytic 5

Q2 a) Find the Fourier integral representation for $f(x) = \begin{cases} 1-x^2 & |x|<1 \\ 0 & |x|>1 \end{cases}$ 6

b)Find the Z transform of $f(k) = \begin{cases} 2^k, & k<0 \\ 3^k, & k>0 \end{cases}$ 6

c)Find the laplace transform of

i) $\int_0^t ue^{-2u}sin3u\,du$ ii) cos2t cos3t cos4t 8

Q3 a) Find the fourier series for f(x)= x^2 in $(0,2\pi)$ 6

b) Find the inverse laplace transform of

i) $\log(\frac{s^2+4}{\sqrt{s+3}})$ ii) $\frac{1}{s^3(s-1)}$ 6

c)Find the nonsingular matrices P and Q such that PAQ is in normal form

where A= $\begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$ 8

Q4 a) Find the complex form of fourier series for f(x)= e^{2x} in $(-\pi,\pi)$ 6

b) solve x-3y-8z =-10, 3x+y-4z =0, 2x+5y+6z =13 6

c)Varify Greens theorem for $\int(\frac{1}{y}dx+\frac{1}{x}dy)$ where C is the boundary of the region x=1 , x=4 y=$\sqrt{x}$ and y=1 . 8

Q5 a)Find the analytic function f(z) whose real part is log (x^2+y^2) . 6

b) Find the inverse Z transform of $f(z)=\frac{1}{(z-1)(z-2)}$ in 1<|z|<2 6

c) Solve by using laplace transform

$\frac{d^2y}{dx^2}+4\frac{dy}{dx}+8y=1\ with\ y(0)=0\ , y^1(0)=1$ 8

Q6 a)Find the half range cosine series for f(x)= $(x-1)^2$ On 0<x<1 6

b)Show that the function $3x^2yi+(x^3-2yz^2)j+(3z^2-2y^2z)k$ is irrotational .Find its scalar potential function. 6

c) Show that u= $(r+\frac{a^2}{r})cos\theta$ is harmonic.

Find its harmonic conjugate and f(z) in terms of z. 8

Q7 a) Show that the real and imaginary part of an analytic function is harmonic. 6

b) Use stokes theorem for $\int_c\ (x^3-3y)dx+(x+siny)dy$ where C is the boundary of triangle wtth vertices (0,0), (1,0),and (0,2). 6

c) Find inverse laplace transform of $\frac{s+2}{(s^2+4s+8)^2}$ 8

Sem-III (old) (ETRX) 18/05/16

Basic of Electronic Circuits

QP Code : 28700

(3 Hours) **[Total Marks :100**

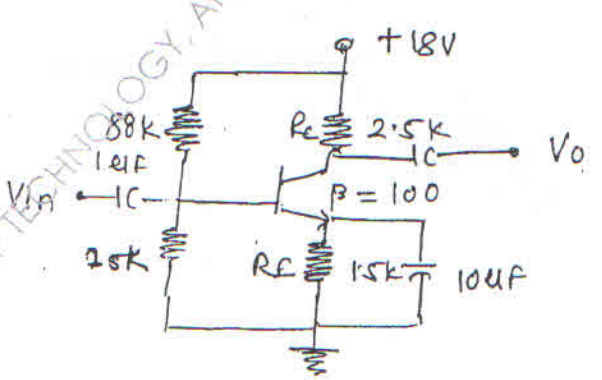
N.B. : (1) Question No. 1 is compulsory.
(2) Attempt any **four** questions out of remaining **six.**
(3) **Assume** suitable **data** wherever **required** and **justify** the **same**

1. (a) Derive the condition for zero temperature drift biasing of FET **5**
(b) Which biasing method can not be used for D-MOSFET and why? **5**
(c) What is maximum reverse voltage (PIV) across a diode in **5**
(i) HWR
(ii) FWR with centre tapped transformer
(iii) Bridge type rectifier
(d) Sketch the circuit diagram zener diode voltage regulator and explain its operation. **5**

2. (a) Explain input protection method in MOSFET **10**
(b) Explain the operation of full wave rectifier and draw the output waveform for V_{Ldc} and I_{Ldc}. **10**

3. (a) Draw neat diagram of CS amplifier with voltage divider (By passed Rs) configuration. Derive the expression for z_i, z_0 and A_v. **10**
(b) Draw and explain positive clamper circuit. **10**
(c) Explain the concept of thermal runway in BJT. **10**

4. (a) For the circuit shown in Figure, determine co-ordinates of operating point of transistor. Draw the DC load line on output characteristic and show location of Q point. **10**



(b) Compare CE, CB and CC for BJT amplifiers. **10**

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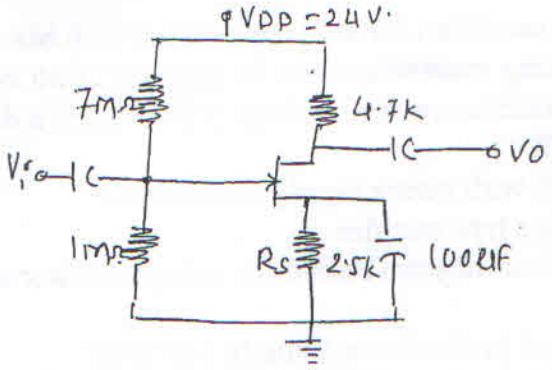
5. (a) For the circuit shown in figure, determine A_v, R_i and R_o. FET has I_{DSS} = 8mA and V_p = -4V. 10



(b) Explain the construction, working principal and characteristic of D-MOSFET. 10

6. (a) Explain various methods of biasing JFET and MOSFET 10
(b) Explain hybrid model for BJT. 15

7. Write short notes on (any **three**):- 20
   (i) Voltage multiplier
   (ii) BJT as a switch
   (iii) Photodiode operation and application
   (iv) V-MOSFET construction and characteristics