Sem III COLD) ETRX EM-III 20/11/2015

QP Code : 1063

(3Hours) Total Marks: 100

N.B. (1) Question No.1 is compulsory.
(2) Attempt any four questions out of the remaining six questions.
(3) Figures to right indicate full marks.

Q. 1

(a) Find k such that $\frac{1}{2}\log\left(x^2+y^2\right)+i\tan^{-1}\frac{kx}{y}$ is analytic 5

(b) Find the Fourier series expansion for $f(x)=x, \quad in \quad (-\pi,\pi)$ 5

(c) Find the inverse Laplace transform of $\frac{s+29}{(s+4)(s^2+9)}$ 5

(d) If $\{f(k)\}=\{2^0,2^1,2^2,\ldots\}$ find $Z\{f(k)\}$. 5

Q.2

(a) Evaluate $\int_0^\infty \frac{\cos at-\cos bt}{t}dt$ 6

(b) Express the following matrices as the sum of symmetric and skew-symmetric matrices. 6

$$\begin{bmatrix}1 & 5 & 7\\ -1 & -2 & -4\\ 8 & 2 & 13\end{bmatrix}$$

(c) Find the Fourier series for $f(x)=\left(\frac{\pi-x}{2}\right)^2$ in the interval $0\le x\le 2\pi$ 8

Hence deduce that $\frac{\pi^2}{12}=\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}\ldots\ldots$

Q.3 (a) Find Laplace Transform of following 6

i) $\frac{e^{-at}-\cos at}{t}$ ii) $(t+\sin 2t)^2$.

(b) Find non-singular matrices P & Q s.t. PAQ is in Normal form . Also find rank of A. 6

$$A=\begin{bmatrix}1 & 2 & 3 & -2\\ 2 & -2 & 1 & 3\\ 3 & 0 & 4 & 1\end{bmatrix}$$

(c) Using Green's theorem evaluate $\int_C\left(\frac{1}{y}dx+\frac{1}{x}dy\right)$ where 'c' is the boundary of the region defined by $x=1,x=4,y=1,\&\ y=\sqrt{x}$. 8

[TURN OVER

Q.4

(a) Obtain complex form of Fourier series for the functions $f(x)=e^x$ in $(0,2\pi)$ 6

(b) Determine the values of a and b for which the system $x+2y+3z=6,\quad x+3y+5z=9,\quad 2x+5y+az=b$ have i) no solution, ii) a unique solution, iii) an infinite number of solutions? 6

(c) Find inverse Laplace Transform of following 8

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

Q.5

(a) Find the constant 'a' so that the function $u=x^2+ay^2$ is harmonic. 6

(b) Show that the vectors X_1, X_2, X_3 are linearly independent and vector X_4 depends upon them, where $X_1=[1,2,4], X_2=[2,-1,3], X_3=[0,1,2], X_4=[-3,7,2]$

(c) Find Fourier integral representation for $f(x)=\begin{cases} e^{ax} & x\le 0,\ a>0 \\ e^{-ax} & x\ge 0,\ a>0 \end{cases}$ 8

Hence show that $\int_0^\infty \frac{\cos\omega x}{\omega^2+a^2}\,d\omega=\frac{\pi}{2a}e^{-ax},\quad x>0, a>0$

Q.6 (a) Obtain half-range sine series for $f(x)=2x \quad in \quad 0<x<2$ 6

(b) Find the bilinear transformation, which maps $z=0,-i,-1$ on to the points $w=i,1,0$. 6

(c) Use Stoke's theorem to evaluate $\int_C \overline{F}.d\overline{r}$ where $\overline{F}=y\,i+z\,j+xk$ and 'C' is the boundary of the surface $x^2+y^2=1-z, z>0$ 8

Q.7

(a) Find inverse Z-transform of $F(z)=\frac{z}{(z-1)(z-4)}, 1<|z|<4$ 6

(b) Construct the analytic function whose real part is $e^{2x}(x\cos 2y-y\sin 2y)$ 6

(c) Using laplace transform solve the following differential equation with the given condition. $(D^2-2D+1)x=e^t$, *with* $x=2, Dx=-1$, *at* $t=0$ 8

27/11/15

S.E Sem III old

BEC ~~ERA~~ ETRX

QP Code : **1106**

(3 Hours) [Total Marks : 100

N.B. : (1) Question No.**1** is **compulsory**
(2) Attempt **any four** out of remaining **6** questions
(3) Assume suitable data wherever required and justify the same

1. Attempt any **four**:- 20
   (a) Explain the bias compensation techniques for BJT
   (b) Prove that for a JFET the gate-source bias for zero temperature drift of drain current is at Vp-0.63 volts.
   (c) Compare all 3 types of BJT amplifiers
   (d) Write and explain the PIV of half wave rectifier, full wave rectifier and bridge wave rectifier circuits.
   (e) Draw and explain hybrid model of BJT.

2. (a) Design a single stage BJT CE amplifier for the following requirements 10
   Av> 100; Zi>3K; Vcc=18v
   (b) Determine Av, Zi and Zo for the above designed circuit? 10

3. (a) Draw the circuit diagram of a full wave rectifier with π filter. Derive expressions for ripple factor. Explain the basic rectifying operation? 10
   (b) Design for full wave rectifier with LC filter which gives a de output voltage of 20 v at a load current of 200mA. The allowable ripple factor is 0.05. 10

4. (a) Draw the common emitter r-π equivalent circuit of the BJT with R_E un-bypassed and derive the expression for- 10
   (i) input resistance (ii) output resistance (iii) voltage gain
   (b) Draw the neat diagram of a JFET amplifier with source resistance by passed derive the expression for the voltage gain. 10

5. (a) Explain the construction ,working principle and characteristics of DMOSFET. 10
   (b) Explain different biasing techniques for E-MOSFET 5
   (c) Compare MOSFET and JFET. 5

6. Design a single stage AC coupled CS amplifier using BFWl to meet the following specifications. 20
   Av = 2 and output voltage=2.5 Vrms. With biasing circuit to give
   (i) Zero temperature drift
   (ii) To operate PET at Idc=Idss/2

7. Write short notes on any **two**: 20
   (i) Zener as a regulator
   (ii) Voltage multiplier
   (iii) A valanche and Zener breakdown.

S.E. EXTC (III) (Old) (R-2009). 16/12/15
Control System

QP Code : **1225**

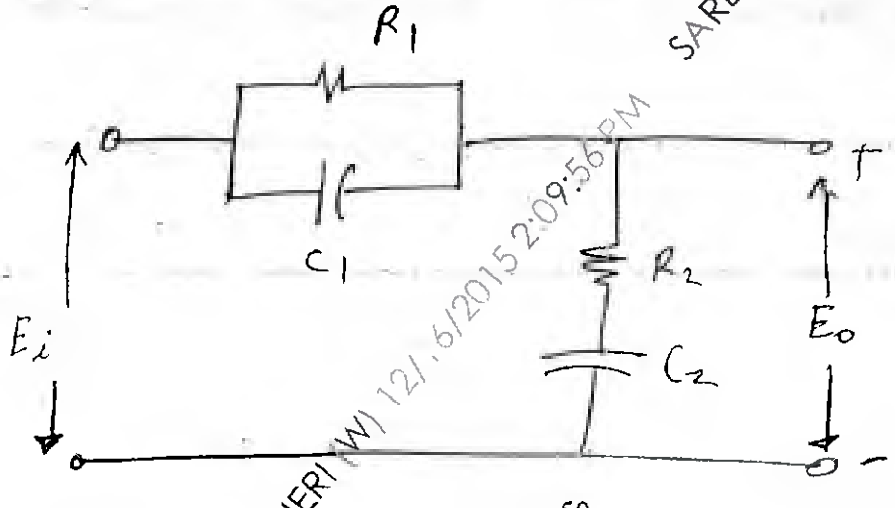
(OLD COURSE)

(3 Hours) [Total Marks : 100

N. B. : (1) Question No. 1 is **compulsory**.
(2) From remaining questions solve any **four**.
(3) Use suitable data, whenever required.

1. (a) Explain any 4 rules of Root locus plots. **20**
(b) Explain how to find K_p, K_v and K_a from Bode plot.
(c) List the types of damping of a second order control system with location of poles.
(d) Differentiate between Bode plots and polar plots.

2. (a) Find the transfer function of the circuit shown **10**



(b) Obtain generalised error series $G(s)=\frac{50}{s(s+10)}$ **10**

If input $r(t) = 2 + 4t + 6t^2$

3. (a) Find natural frequency, damped frequency, damping ratio and comment on the type of damping given error response for a unit step input. **10**
$e(t) = 5e^{-2t} \sin[50t - 50^\circ]$
(b) What is principle of argument? Explain in detail and how it is used to obtain Nyquist plot. **10**

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4. (a) Plot Bode Plot 10

$$G(s)H(s) = \frac{50(s+3)}{s(s^2+5s+50)}$$

Hence obtain G.M. and P.M.

(b) Explain construction and working of stepper motor in detail. 10

5. (a) Obtain unit step response c(t) of underdamped second order control system. 10

(b) Check for stability and mention how many roots lie in the right hand side of S-plane. 10

$s^6 + s^5 + 3s^4 + 3s^3 + 2s^2 + s + 1$

6. (a) Plot Root locus of an unity feedback control system. 12

$$G(s) = \frac{k(s+3)}{s(s+5)(s+6)(s^2+2s+2)}$$

Also find K marginal and K critical for damping $\xi = 1$ at break away point.

(b) Sketch the Nyquist plot and hence comment on closed loop stability. 8

$$G(s)H(s) = \frac{10(s+2)}{s(s-1)}$$

If 10 is replaced by K. Find K marginal and Range of K from the Nyquist plot.

7. (a) Plot polar plot of $G(s)H(s) = \frac{10(s+3)}{s^2(s+5)(s+8)}$ 10

(b) Obtain overall transfer function of the block diagram 10