S.E. Sem III (Old). ETRX Engg. Maths-III 14/5/15 (1/2)

(OLD COURSE) **QP Code : 4581**

(3 Hours) **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.

1. (a) Show that the function $u = x^4 - 6x^2y^2 + y^4$ is Harmonic. 5
(b) Find the Fourier series expansion for $f(x) = x \quad \text{in} \quad (0, 2\pi)$ 5
(c) Find the Laplace transform of $\sinh at \cdot \sin at$ 5
(d) Find Z-transform of $\{k \cdot e^{-ak}\}, \ k \geq 0$ 5

2. (a) Evaluate $\int_0^\infty e^{-3t} t \sin t \, dt$ 6
(b) Find the Fourier series expansion for $f(x) = 2x \quad in \quad (0, 2\pi)$ 6
(c) Test for consistency the following equations and if possible solve them.
$4x - 2y + 6z = 8, \ x + y - 3z = -1, \ 15x - 3y + 9z = 21$ 8

3. (a) Find Laplace Transform of following
i) $t\, e^{-2t} \sinh 4t$ ii) $\frac{1}{t} e^{-t} \sin t$ 6
(b) Reduce the following matrices to normal form and find its rank.
$$A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$$ 6
(c) Using Green's theorem evaluate $\int_C (2x^2 - y^2)dx + (x^2 + y^2)dy$ where 'c' is the boundary of the surface enclosed by the lines $x = 0, y = 0, x = 2, y = 2$. 8

4. (a) Obtain complex form of Fourier series for the functions $f(x) = e^{ax} \ in \quad (0, \pi)$ 6
(b) Express the following matrix as the sum of symmetric and skew-symmetric matrices.
$$\begin{bmatrix} 3 & -2 & 6 \\ 2 & 7 & -1 \\ 5 & 4 & 0 \end{bmatrix}$$ 6
(c) Find inverse Laplace Transform of following
i) $\log\left(\frac{s-2}{s-3}\right)$ ii) $\frac{s+1}{s^2 - 4}$ 8

5. (a) Find the constants a, b, c, d, e if
$f(z) = (ax^4 + bx^2y^2 + cy^4 + dx^2 - 2y^2) + i(4x^3y - exy^3 + 4xy)$ is analytic. 6
(b) For the matrix A verify that A (adj A) $= |A| I$ where $A = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ 6

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(c) Prove that $\sin x, \sin 2x, \sin 3x, \cdots\cdots$ is orthogonal on $[0,2\pi]$, and construct orthonormal set of functions 8

6. (a) Find half range cosine series for $f(x)=x, \quad (0, 2)$. 6

(b) Find the bilinear transformation under which 1, i, -1 from the z-plane are mapped onto 0, 1, ∞ of w-plane. 6

(b) Use Stoke's theorem to evaluate $\int_C \overline{F}.d\,\overline{r}$ where $\overline{F} = x^2\ i + x\,y\ j$ and C is the boundary of the rectangle $x=0, y=0, x=a, y=b$. 8

7. (a) Prove that the following matrix is orthogonal and hence find A^{-1}

$$A=\frac{1}{9}\begin{bmatrix} 1 & 4 & 8 \\ 8 & -4 & 1 \\ -4 & -7 & 4 \end{bmatrix}$$ 6

(b) Find the analytic function whose real part is $u = x^3 - 3x\,y^2 + 3x^2 - 3y^2 + 1$ 6

(c) Using laplace transform solve the following differential equation with given condition. $(D^2 - 4)\,y = 3e^t, \quad y(0)=0,\ y'(0)=3$ 8

S.E. ETRX (III) (old).
Basic Electronic ckts
20/5/15

QP Code : **4583**

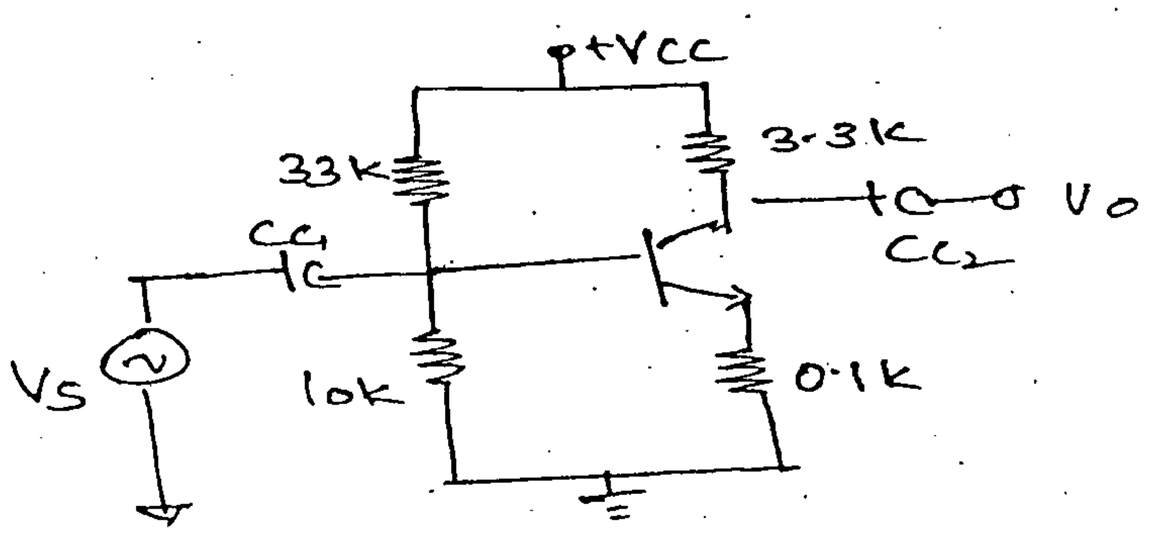
(OLD COURSE)

(3 Hours) **[Total Marks : 80**

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

1. (a) Draw a positive peak clipper with waveform **5**
(b) Derive the expression for the stability factor 's' of fixed bias circuit **5**
(c) Draw a bridge rectifier circuit with waveform **5**
(d) Compare CE, CB, CC amplifier circuit. **5**

2. (a) Draw and explain fullwave rectifier circuit with waveform **10**
(b) Calculate Ri, Ro, Av and Ai for the circuit shown **10**



hie = 2kΩ
hfe = 100

3. (a) Explain various methods of biasing JFET and MOSFET **10**
(b) Explain BJT as a switch **5**
(c) Explain bias compensation technique for BJT **5**

4. (a) Draw the neat diagram of JFET CS amplifier with unbypassed CE capacitor and derive the expression for the voltage gain, input impedance and output impedance **10**
(b) Draw and explain voltage multiplier circuit. **10**

5. Design a single stage RC coupled CE amplifier using transistor with the following specifications of an amplifier **20**
hfe= 200, hie= 2.0k, hoe= hre= 0
The amplifier must have
$|Av| \geq 150$, $S_{I(O)} \leq 10$, $V_0 = 3$ volts
Vcc =18v f_L=10Hz
Calculate Av, Ri and R0 of the design amplifier

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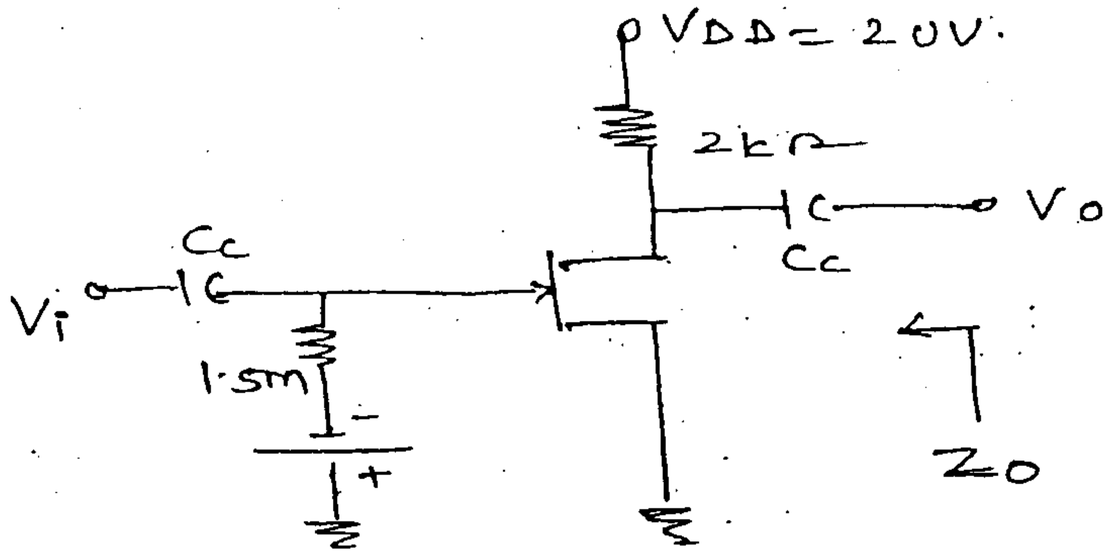
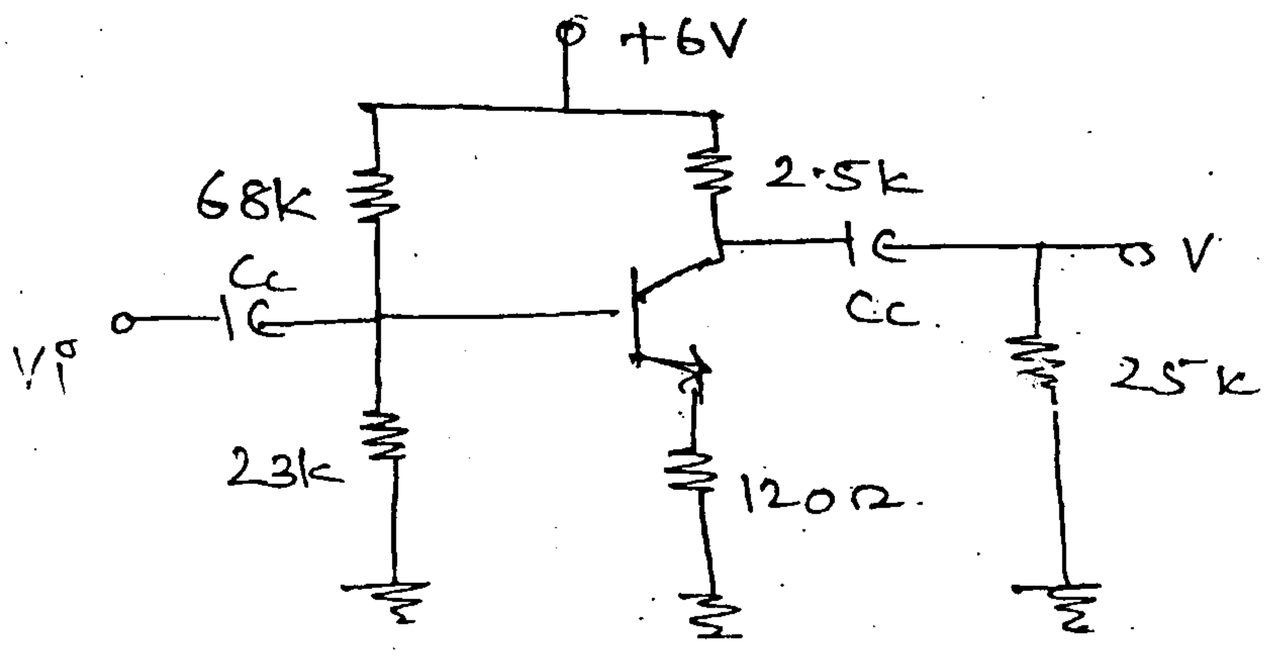
6. (a) Calculate Av, Ri and Ro for the circuit shown 10



(b) An Amplifier circuit shown in Fig. Determine the co-ordinates of the operating point Q and thermal stability 10



7. Write a short notes on (any **three**):— 20

(a) Photo diode operation and application
(b) Voltage Regulator(Using Zener diode)
(c) EMOSFET and DMOSFET
(d) LC filter

SEI ETRX I sem - ∅II old. 5/6/2015

CS.

Q.P. Code : **4589**

(OLD COURSE)

(3 Hours) [Total Marks :100

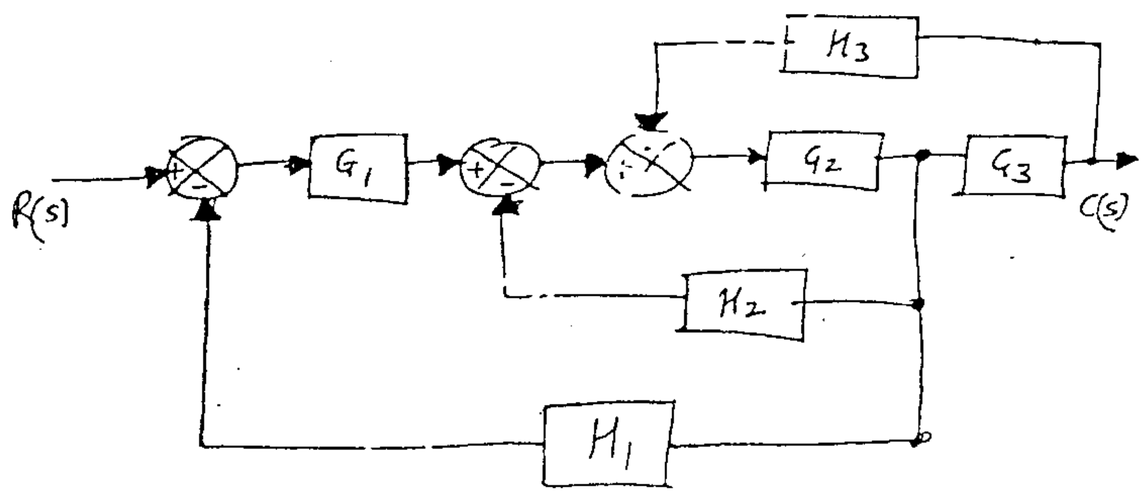
N.B. : (1) Question No. 1 is **compulsory**
(2) Solve any **four** from out of remaining **six**.
(3) Assume suitable data whenever required.
(4) **Figures** to the **right** indicate **full** marks.

1. (a) Explain how to find G.M. and P.M. from polar plots. **20**
(b) Explain any five rules of root locus plot
(c) Explain principle of argument.
(d) Derive an expression for peak time of a standard second order control system

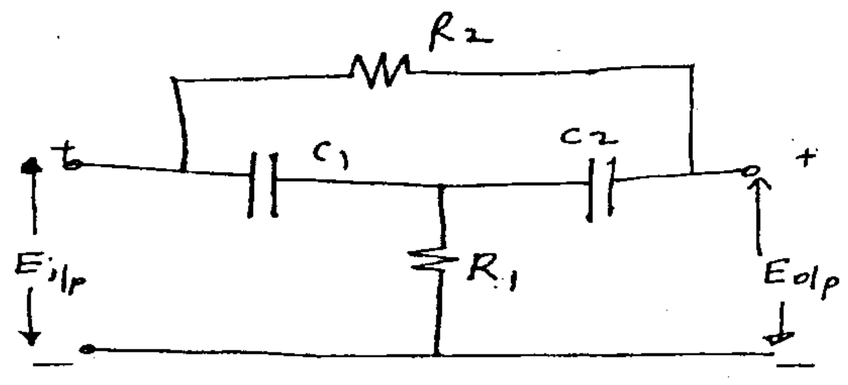
2. (a) Obtain Bode plot $G(s)\,H(s)=\dfrac{20[1-s]}{s(s+3)(s^2+2s+25)}$ **10**

Hence obtain G.M. and P.M.

(b) Obtain overall Transfer function. **10**



3. (a) Obtain Transfer function $\dfrac{E_{o/p}}{E_{i/p}}$ of the network shown below using Masons gain signal flow graph. **10**



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(b) The error response $e(t) = 3.5\ e^{-10t} \sin [60t+60^0]$ for a unit step input. Find natural frequency, damped frequency, damping ratio and comment on the type of damping. 10

4. (a) Plot root locus plot $G(s)\,H(s)=\dfrac{k}{s(s+3)(s^2+3s+20)}$ 12

(b) Find K marginal and frequency of oscillation given 8

$$1+\frac{K}{s(s^2+3s+3)(s^2+16s+18)}=0$$

5. (a) Derive an expression for Bandwidth of a standard second order control system 8

(b) Obtain polar plot Given $G(s)H(s)=\dfrac{45(s+2)}{s^2(s+4)(s+6)}$ 12

Find Wpc and G.M. If '45' is replaced by k then using polar plot find range of k for stability and k marginal.

6. (a) $G(s)H(s)=\dfrac{K}{s(S+8)(s^2+s+1)}$ 8

Determine the value of k that will cause sustained oscillations in the closed Loop system. Also find the frequency of oscillation

(b) Obtain Nyquist plot:- 12

(i) $G(s)H(s)=\dfrac{18}{s(s-4)}$ (ii) $G(s)H(s)=\dfrac{14(s+2)}{s(s-3)}$

Hence comment on stability and number of pole's on R.H.S of jw axis.

7. Write short notes on the following 20

(a) Synchro transmitters
(b) Static error constants
(c) Stepper motor's
(d) Compensation techniques

RJ-Con. 12194-15.