S.E. Sem III Old M-2014
Sub:- BEC ETRX

22/5/14

(OLD COURSE) **QP Code : MV-17898**

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

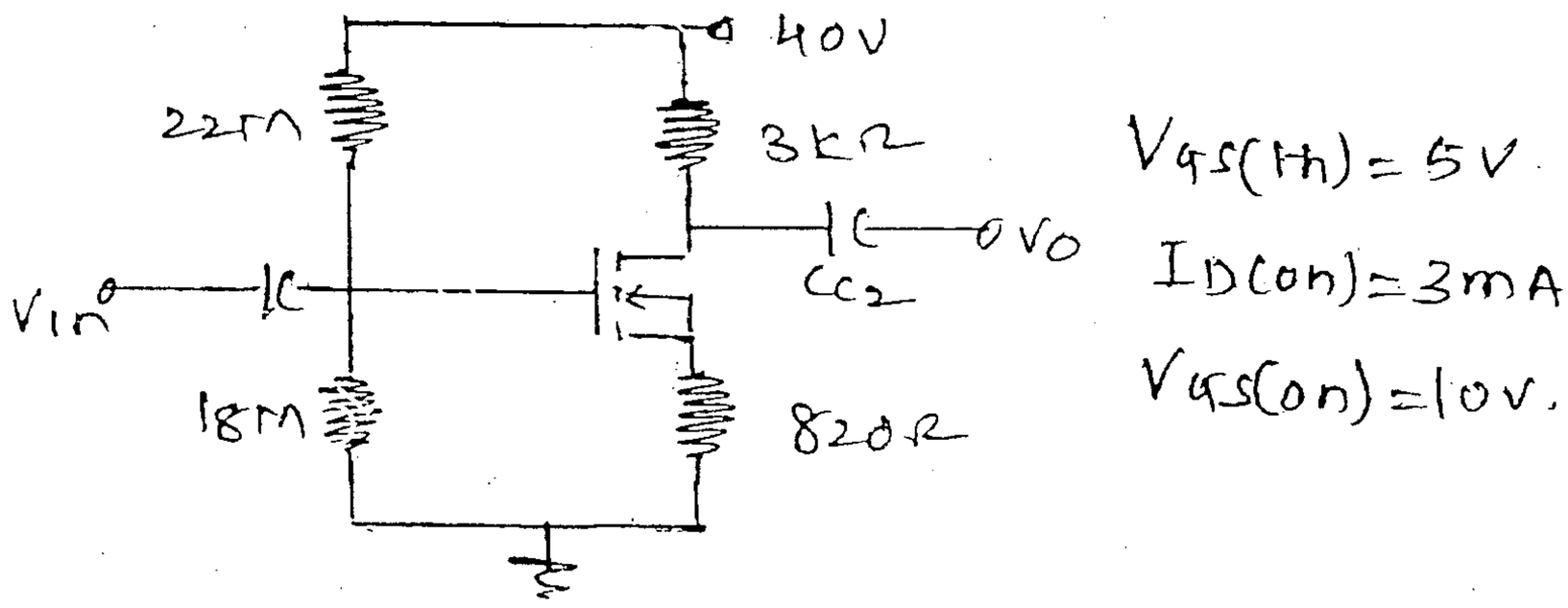
N.B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** out of remaining **six** questions.
(3) Assume **suitable** data wherever **required** and justify the **same**.

1. (a) Derive the condition for zero temperature biasing of FET. **5**
   (b) Draw and explain positive peak clipper circuit. **5**
   (c) Compare BJT and FET. **5**
   (d) Explain the phenomenon of bias compensation. **5**

2. (a) Design a single stage CE amplifier suitable for low brequencies upto 10Hz and give voltage gain | AV | $\geq$ 70 and output voltage of 4·5 V employing transistor type BC 147 A. Calculate voltage with negligible distortion that can be obtained from designed circuit. **15**
   (b) Calculate AV, Ri & Ro of the designed amplifier. **5**

3. (a) Explain various methods of biasing EMOSFET. **10**
   (b) Derive expression for gain Av input resistance Ri and output resistance Ro of common source JFET amplifier. **10**

4. (a) Draw circuit diagram of bridge rectifier with LC filter. Explain its working. Also derive expression for ripple factor. **10**
   (b) For circuit shown in fig. Calculate the values of I_{DQ}, V_{GSQ} & V_{DS}. **10**



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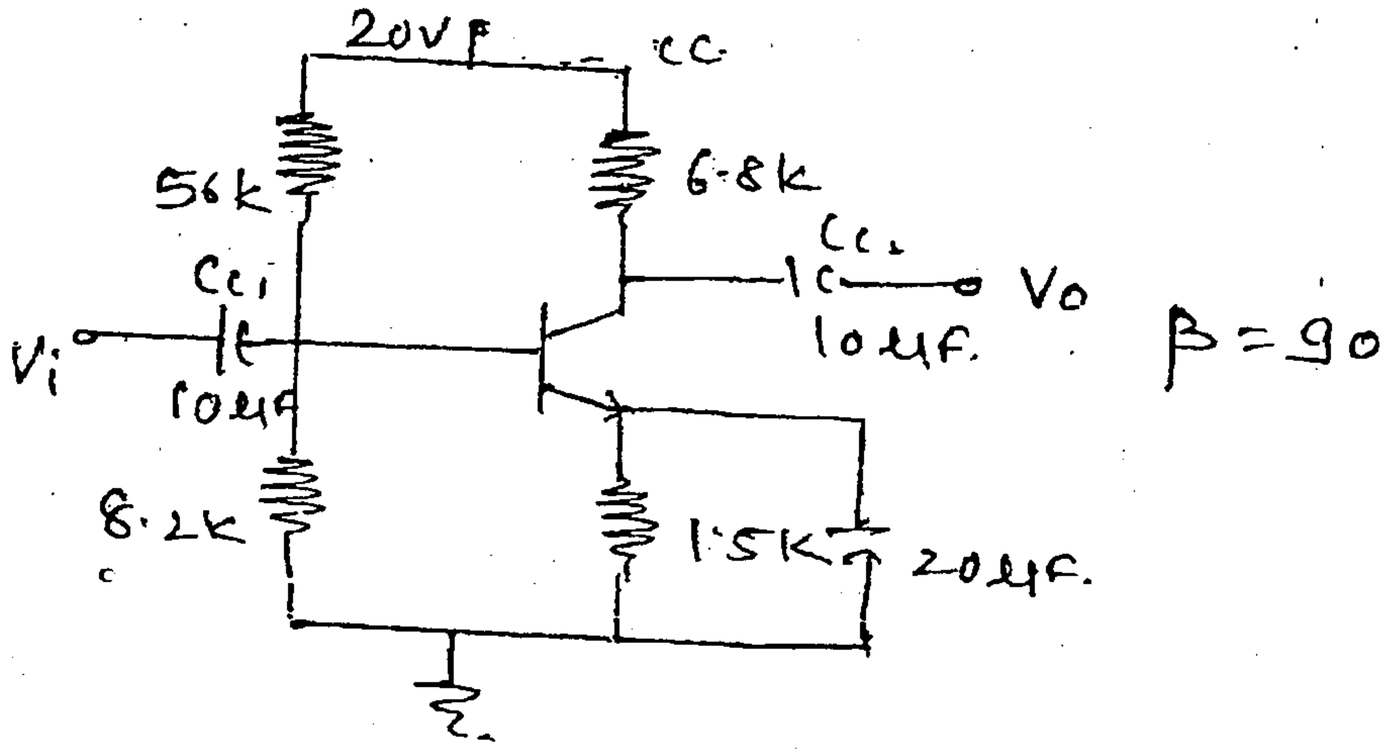
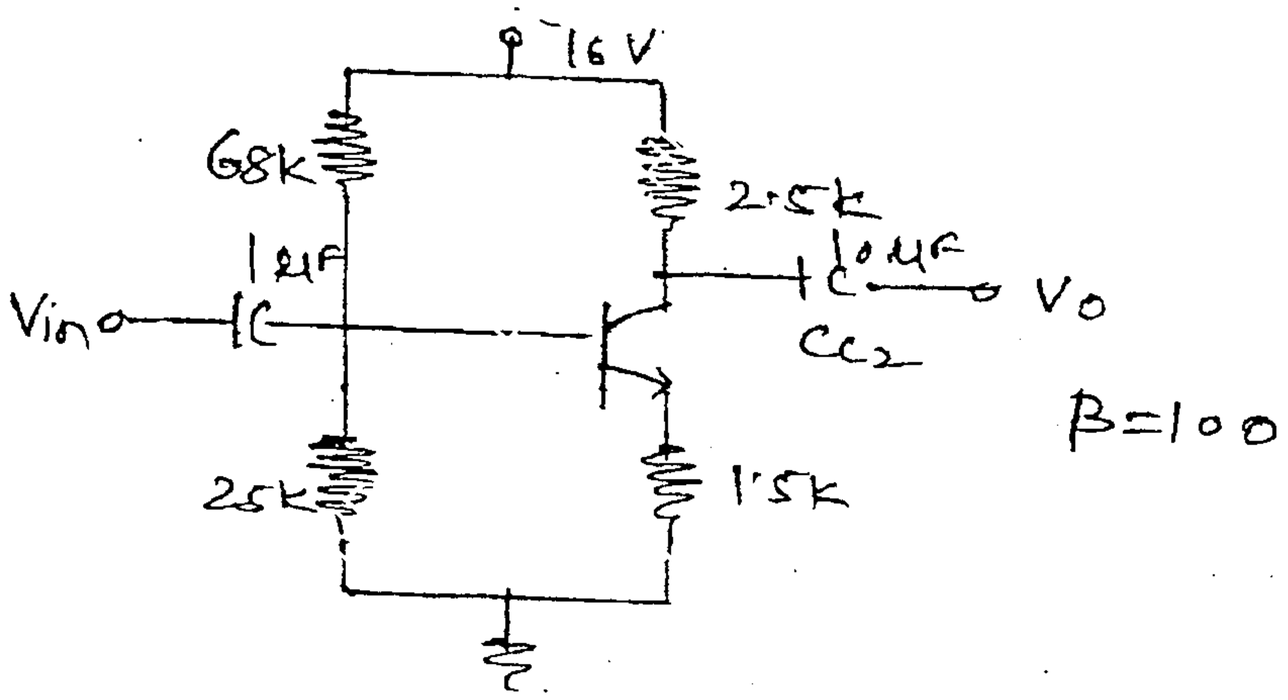
5. (a) For the circuit shown in fig. Determine the input and output inpedance, voltage gain and current gain. Use approximate analysis. 10



(b) Explain construction, working principal and characteristic of EMOSFET. 10

6. (a) In a circuit shown in Figure. Determine the co-ordinates of operating point of the transistor. Draw the DC load line on output characteristic and Show the location of Q point. 10



(b) Derive the expression of stability factor of fixed bias and voltage divider bias circuit. 10

7. Write a short note on (any **three**) :— 20
   (a) Voltage multiplier circuit
   (b) Clamper circuit
   (c) Transistor as a switch
   (d) Zener as a voltage regulator.

S.E Sem III Old ETRX M-14

Sub:- ENA & S

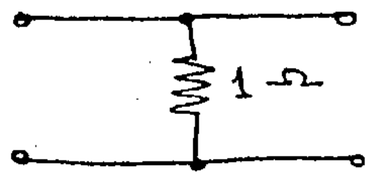
RT–Exam.–Feb.–14–1–110

(OLD COURSE) **QP Code : MV–18036**

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

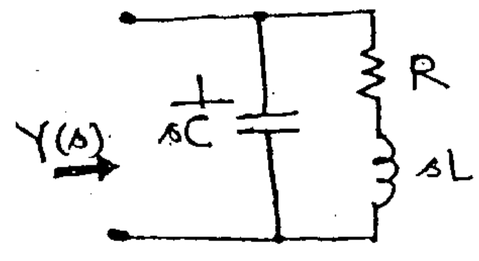
N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from remaining **six** questions.
(3) Assume **suitable** data wherever **required** but **justify** the same.
(4) **Figures** to the **right** indicate **full** marks.

1. (a) Determine Z and Y parameters of the network shown :– **5**



(b) What are the conditions for rational functions F(s) with real coefficients to be prf? **5**

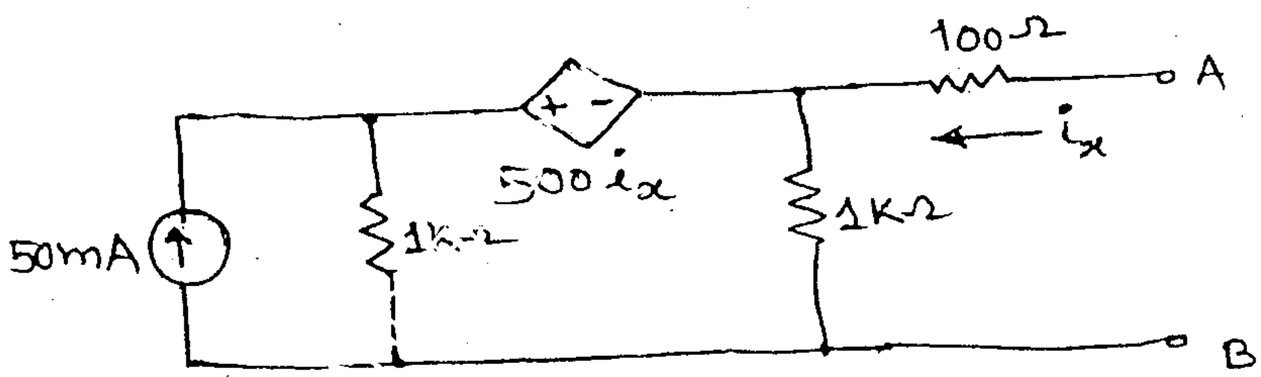
(c) Find the poles and zeros of the admittance Y(s) of network shown in terms of R, L and C. **5**



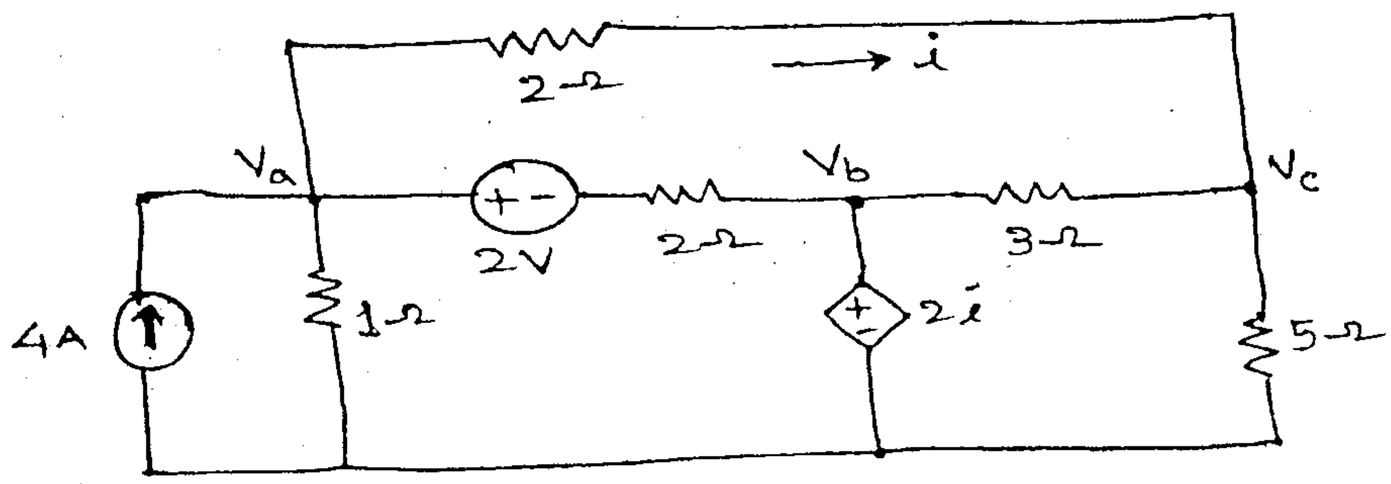
(d) A coil having 10Ω resistance and 14 H inductance is connected across a d.c. voltage of 140V. **5**

Calculate :– (i) The value of current 0·4 sec after switching on the supply.
(ii) After the current has reached its final value, how much time it would take for the current to reach 8 Amp after switching off the supply.

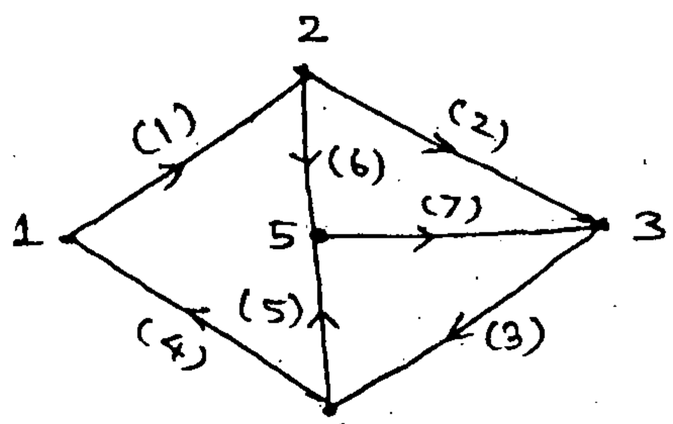
2. (a) Find the Thevinin and Norton equivalent circuits of the given network. **10**



(b) Find V_a, V_b and V_c using Nodal Analysis. **10**



3. (a) Find the fundamental tieset and cut set matrix for the graph of network shown. **10**



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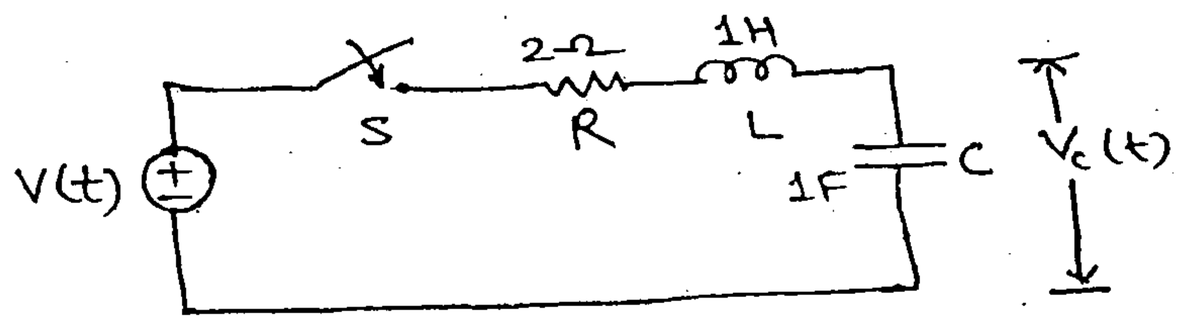
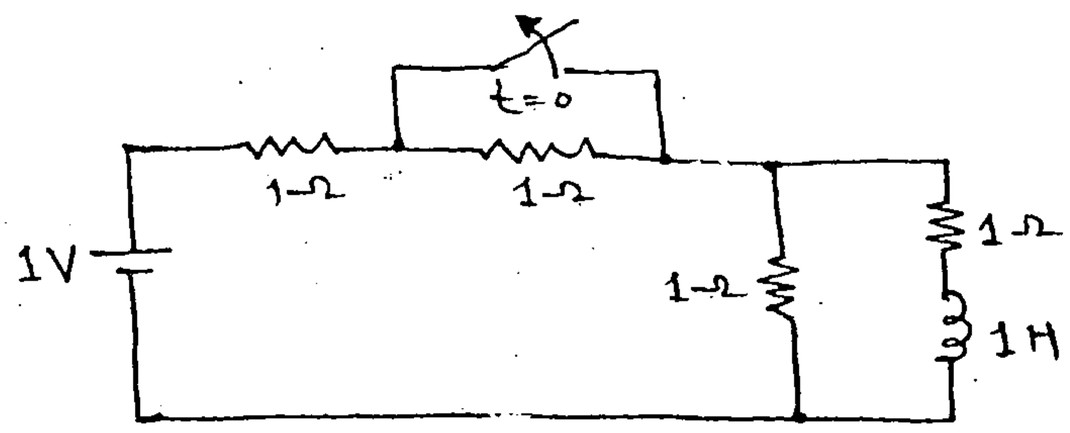
(b) Find the impulse response of the voltage across capacitor in the network shown. **10**
Also determine response $V_c(t)$ for step input.

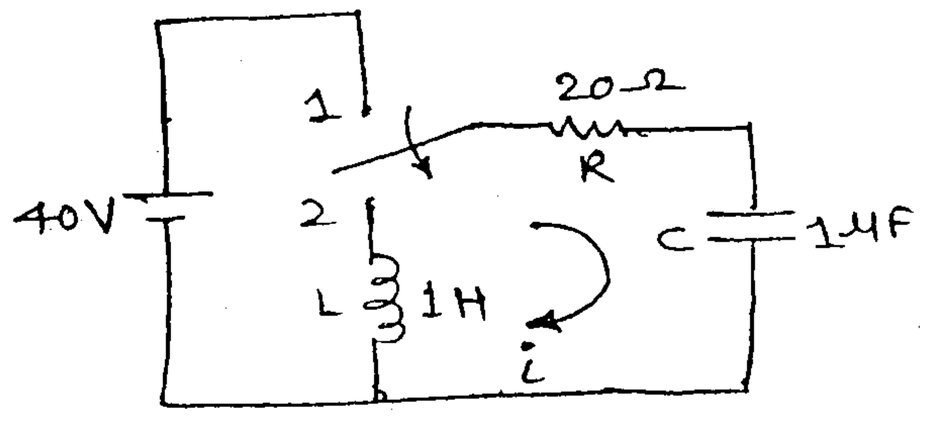


4. (a) The network shown is initially under steady state conditions. The switch is opened at t = 0. Find the voltage across inductance as function of t. **10**

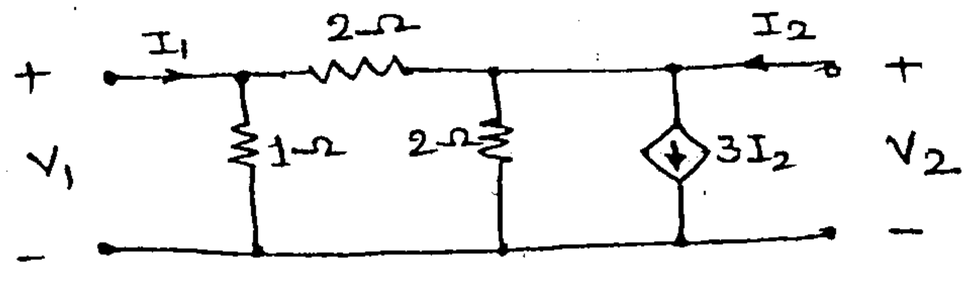


(b) In the network shown below, the switch is changed from position 1 to 2 at t = 0 steady state conditions having reached before switching. **10**

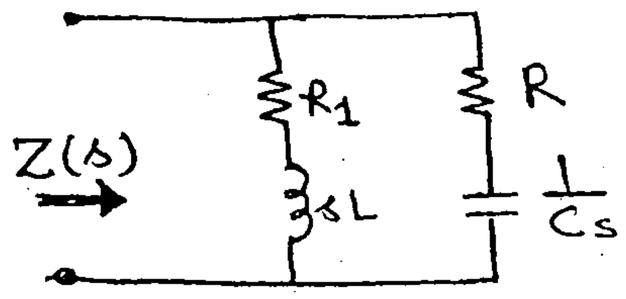
Find the values of i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$



5. (a) Find the impedance and admittance parameters of the given network. **10**



(b) The poles and zeros of the network shown below are as follows : **10**
poles at $-1 \pm j\sqrt{5}$, zeros at –1, –3 and the scale factor is K. If Z(0) = 1. Find the values of R, R_1, L and C.



6. (a) Check whether the following functions are prf or not :– **10**

(i) $F(s) = \dfrac{s^2 + s + 6}{s^2 + s + 1}$

(ii) $F(s) = \dfrac{2s^4 + 7s^3 + 11s^2 + 12s + 4}{s^4 + 5s^3 + 9s^2 + 11s + 6}$

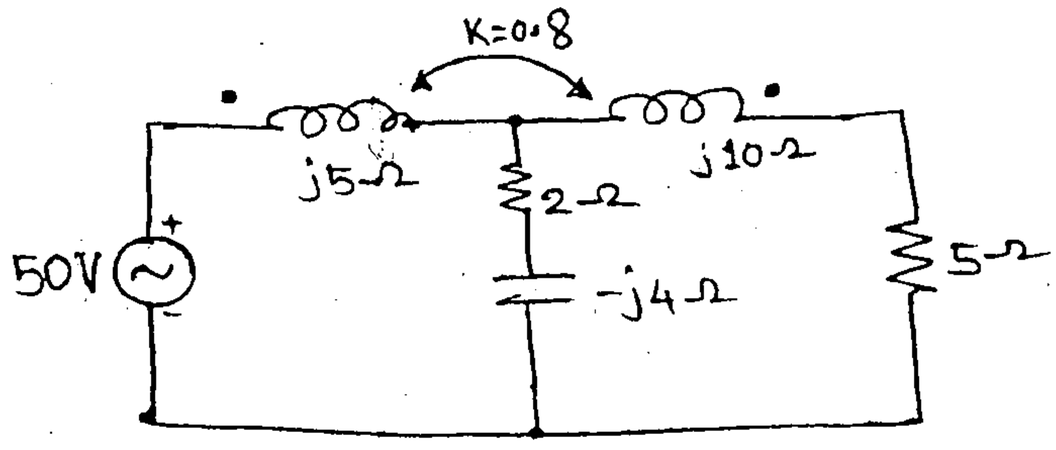
(b) Realize the two canonical Foster networks from the driving point impedance function – **10**

$$Z(s) = \frac{s^2 + 5s + 4}{s^2 + 3s}$$

7. (a) Synthesize the Cauer first and second forms of the network if the LC driving point impedance function given – **10**

$$Z(s) = \frac{s^4 + 10s^2 + 9}{s(s^2 + 4)}$$

(b) Find the voltage across 5Ω resistor using Mesh Analysis. **10**



31 May 2014 Engg Maths-III (old) SE ETRX TII

(OLD COURSE) QP Code : **MV-17868**

(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) Prove that $f(z) = x^2 - y^2 + 2ixy$ is analytic and find $f'(z)$ **5**
(b) Find the Fourier series expansion for $f(x) = |\sin x|$, in $(-\pi, \pi)$ **5**
(c) Find the Laplace transform of $(1+2t-3t^2+4t^3)H(t-2)$ **5**
(d) If $\{f(k)\} = 3^k$, $k<0$
$= 2^k$, $k \geq 0$ find $z\{f(k)\}$. **5**

2. (a) Evaluate $\int_0^\infty \frac{t^2 \sin 3t}{e^{2t}} dt$ **6**
(b) Find the Fourier series expansion for $f(x) = x^2$, in $(0,a)$ **6**

Hence deduced that $\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} \ldots\ldots\ldots$

(c) Find the inverse of S and then the matrix SAS^{-1} where **8**

$$S = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix} \text{ and } A = \frac{1}{2}\begin{bmatrix} 5 & 2 & 1 \\ 1 & 4 & -1 \\ -1 & -2 & 3 \end{bmatrix}$$

3. (a) (i) Find Laplace Transform of $\frac{1}{t}(\cos at - \cos bt)$ **6**

(ii) Find Laplace Transform of $\frac{2 \sin t \sin 2t}{t}$

(b) Find non-singular matrices P & Q s.t. PAQ is in Normal form. Also find rank of A & A^{-1} if it exist. **6**

$$A = \begin{bmatrix} 1 & 3 & 6 & -1 \\ 1 & 4 & 5 & 1 \\ 1 & 5 & 4 & 3 \end{bmatrix}$$

(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 (-1,1) 6
(b) Test for consitency the following equations and if possible solve them x+y+z=6, x-y+2z=5, 3x+y+z=8, 2x-2y+3z=7 6
(c) Find inverse Laplace Transform of following. 8

$\tan^{-1}\left(\frac{s+a}{b}\right)$ (ii) $\frac{5s^2+8s-1}{(s+3)(s^2+1)}$

5. (a) Show that $u = y^3-3x^2y$ is harmonic function. Find its harmonic conjugate and corresponding analytic function. 6
(b) Examine the vectors X_1 =[3,1,1], X_2 =[2,0,-1] ,X_3 = [4,2,1] are linearly independent. 6
(c) Find Fourier integral representation for $f(x) = \begin{cases} 1-x^2 & \text{for} \mid x \mid \leq 1 \\ 0 & \text{for} \mid x \mid > 1 \end{cases}$ 8

6. (a) Obtain half-range sine series for $f(x) = x^2$ in $0<x<3$. 6
(b) Find the bilinear transformation, which maps the points z = -1,1, ∞ onto the points w= $-i$,-1,i. 6
(c) Verify stoke's theorem for $\overline{F}$ = (x+y) i+ (y+z) j - xk and s is the surface of the plane 2x+y+z=2 in the first quadrant. 8

7. (a) Find inverse Z-transform of $F(z) = \frac{1}{z^2-3z+2}, \mid z \mid > 2$ 6

(b) Find the analytic function $f(z)$ =u+iv in terms of z if $u+v = \frac{x}{x^2+y^2}$ 6

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

S.E. ETRX Sem III Old M-2014

Sub: CS

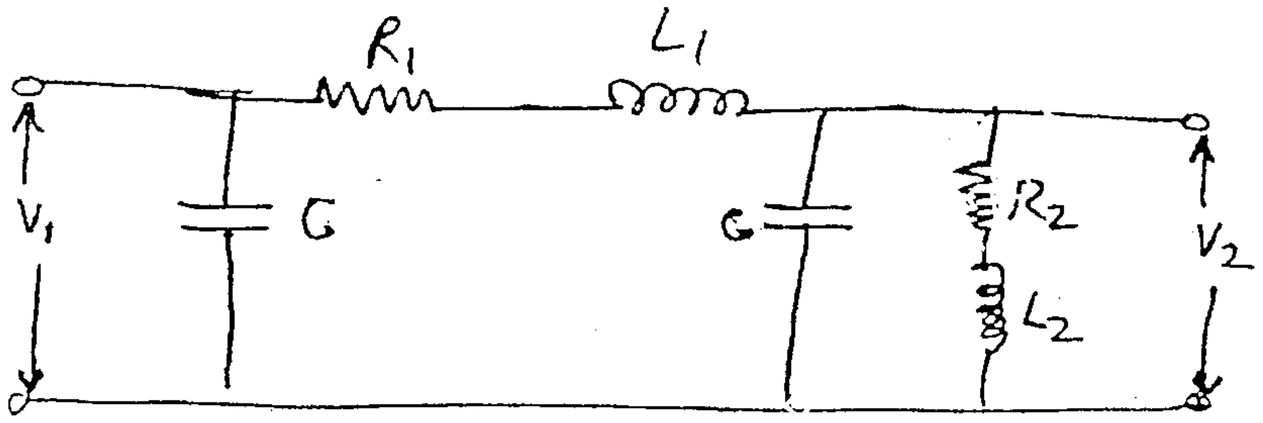
(OLD COURSE) QP Code : **MV-18006**

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

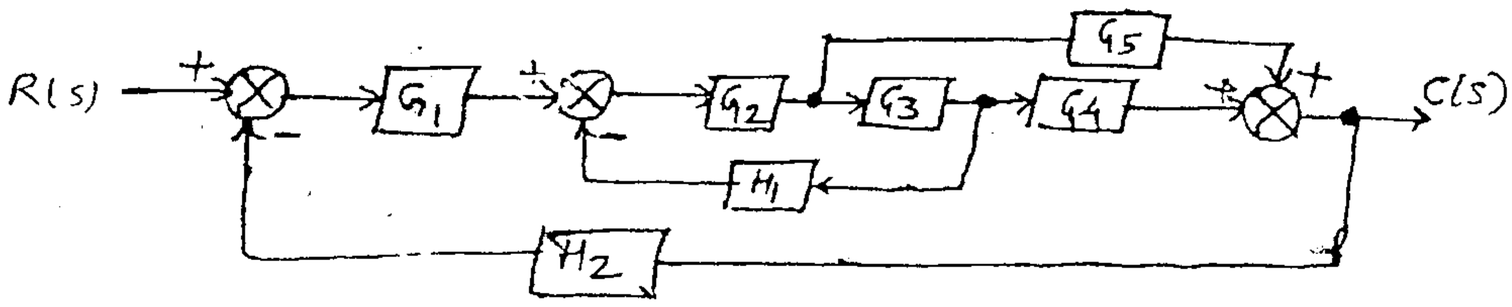
N. B. : (1) Question No. **1** is **compulsory**.
(2) Solve any **four** out of remaining questions.
(3) Assume suitable **data** if **required**.

1. Attempt following :- **20**
   (a) Compare the open loop control system and closed loop control system, with suitable examples.
   (b) How to determine GM and PM from Bode plot.
   (c) Explain the rules for construction of root locus.
   (d) Explain the rules for calculating transfer function from signal flow graph.

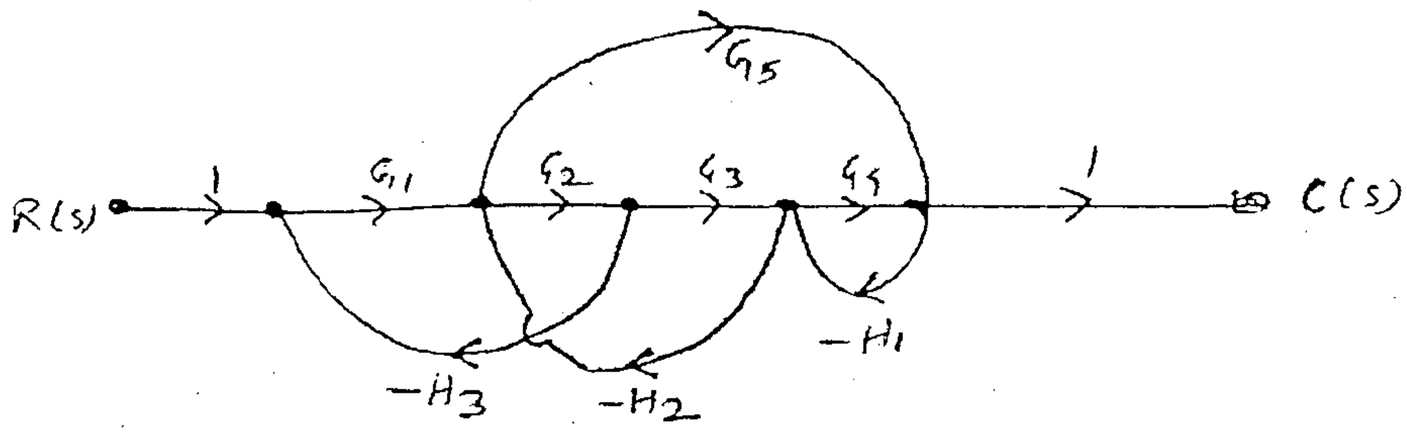
2. (a) Determine the transfer function of electrical network shown below :- **10**



(b) Determine the transfer function of control system represented by following block diagram. **10**



3. (a) Find $\frac{C(s)}{R(s)}$ for following SFG. **10**



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Con. 13595-14.

(b) Derive the expression for output response of a second order underdamped control system. Assume the input to be unit step signal. **10**

4. (a) for a unity feedback system $G(s) = \frac{20(s+1)}{s(s+2)(s^2+2s+2)}$ **10**

Find the static error coefficients and steady state error if u (t) = 10+20t.

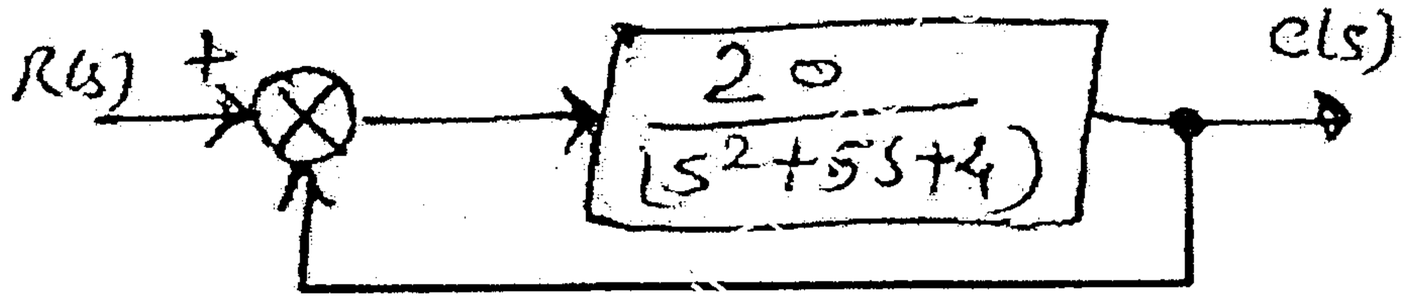
(b) For a unit feedback control system with open loop transfer function **10**

$G(s) = \frac{4}{s(s+5)}$.

Find :- (i) Undamped natural frequency
(ii) Damping ratio
(iii) Peak overshoot
(iv) Settling time for 2% criteria.

5. (a) For a system shown below, $G(s) = \frac{20}{(s^2+55+4)}$ with unit feedback. **10**

Find the time domain specifications when a unit step input is applied.



(b) Determine the stability of a system represented by $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16$ **10**

Also determine the value of frequency of oscillations.

6. (a) Draw the root locus for the system shown by $G(s)H(s) = \frac{k}{s(s+3)(s+6)}$ **10**

(b) For the unit feedback control system $G(s) = \frac{10}{s(s+1)(s+5)}$, sketch the **10**

Bode plot.

7. (a) Given $G(s)H(s) = \frac{12}{s(s+1)(s+2)}$, draw the polar plot. Comment on **10**

stability of a systero.

(b) Using Nyquist stability criterion, determine the stability of the system **10**

whose open loop transfer function is $G(s)H(s) = \frac{(s+1)}{s^2(s-2)}$
