S.E ExTC sem III OTR M-2014

Sub- NT.

QP Code : MV-18000

(OLD COURSE)

(3 Hours) Total Marks : 100

N.B. (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** out of remaining **six** questions.
(3) Make **suitable** assumptions if **required** and **justify** the **same.**

1. (a) Find absolute, relative and percentage error in following numbers. Determine number of significant digits. **5**
   i) a = 123.41769543 $\quad \bar{a} = 123.41$
   ii) b = 0.0053102500 $\quad \bar{b} = 0.0051$
   iii) c = 450550 $\quad \bar{c} = 450552$

   (b) Define the operators $\Delta, \nabla, \delta, \mu$ & E. Prove that **5**
   i) $\frac{\Delta}{\nabla} - \frac{\nabla}{\Delta} = \Delta + \nabla$ $\quad$ ii) $E = 1 + \Delta$

   (c) Using Picard's method obtain upto the fifth approximation of the equation **5**
   $\frac{dy}{dx} = x + y$ such that $y = 1$ when $x = 0$.

   (d) Derive the equation for Regula – falsi method using geometrical interpretation. **5**

2. (a) List the bracketing methods and open methods and find the real root of the equation $x \log x = 1.2$ using Newton Raphson method correct to three decimal places. **10**

   (b) Solve the following equations by Gauss - Seidel method. **10**
   $20x + y - 2z = 17, \quad 3x + 20y - z = -18, \quad 2x - 3y + 20z = 25.$

3. (a) The table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth's surface: **10**

X = height	100	150	200	250	300	350	400
D =distance	10.63	13.03	15.04	16.81	18.2	19.90	21.27

   Find the value of distance when $X = 118$, $X = 218$ & $X = 418$ feet.

   (b) Using Newton's divided difference formula, find the value of f(9) from the following table. **10**

x	5	7	11	13	17
$f(x)$	150	392	1452	2366	5202

4. (a) Write a program for Lagrange's interpolation method and using this formula, find the value of y when $x = 5$ from the following table. 10

x	0	2	3	6
y	648	704	729	792

(b) The result of measurement of electric resistance R of a copper bar at various temperatures t^0C are listed below: 10

t	36	32	34	31	32	32	34
R	76	77	79	80	82	83	85

Find a relation $R = a + bt$

5. (a) The velocity of the train which starts from rest is given by the following table, the time being reckoned in minutes from the start and speed in km/hour. 10

Time	3	6	9	12	15	18
Velocity	22	29	31	20	4	0

Estimate approximately the distance covered in 18 minutes by Simpson's $3/8^{th}$ rule.

(b) Solve $\frac{dy}{dx} = x^2 + y^2$ with $x_0 = 0$, $y_0 = 1$ by Euler's modified formula find the value of y when $x = 0.5$ taking $h = 0.25$. 10

6. (a) Solve $\frac{dy}{dx} = \sqrt{x+y}$ with initial conditions $y(1) = 2$ and find y at $x = 1.2$, $x = 1.4$ by Runge - Kutta Method of Fourth Order taking $h = 0.2$. 10

(b) Solve the following set of equations using Gauss Jordan method. 10

$6x + 15y + 2z = 72$, $x + y + 54z = 110$, $27x + 6y - z = 85$.

7. (a) Explain the propagation of errors. 5

(b) Derive Newton Cotes integration formula and also write a program Simpson's $1/3^{rd}$ rule. 10

(c) Write a short note on Golden section search. 5

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SE EXTC III Applied Maths-III (old) 31 May 2014

(OLD COURSE) **QP Code : MV-17874**

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

N.B. First question is **compulsory** answer any **four** out of remaining **six** question.

1. (a) if A and B are symmetric matrices then show that AB is symmetric if and only if AB and BA exist and if AB = BA. **5**
   (b) Find Laplace transform of Sin2t.Cost.Cosh2t. **5**
   (c) Find the Fourier transform of $f(x) = e^{-|x|}$ **5**
   (d) Find z-transform of $\frac{a^k}{k!}$, $k \geq 0$. **5**

2. (a) Find Laplace transform of $\frac{\sin^2 t}{t^2}$. **6**
   (b) If $A = \begin{bmatrix} 1/3 & 2/3 & a \\ 2/3 & 1/3 & b \\ 2/3 & -2/3 & c \end{bmatrix}$ is orthogonal, find a, b, c. Also find A^{-1}. **7**
   (c) Obtain Fourier expansion of f(x) = | cos x | in $(-\pi, \pi)$ **7**

3. (a) Solve the equation – **6**

$$y(t) = t - \int_0^t y(u) \sin(u - t)\, du$$

   (b) If f(x) = x cos x obtain Fourier expansion of f(x) in $(-\pi, \pi)$ **7**
   (c) Find z-transform of $c^k \cosh ak$, $k \geq 0$. **7**

4. (a) Find Fourier Expansion of– **6**
   $f(x) = x - x^2, -1 < x < 1$.
   (b) Determine the value of k for which the following equations are consistent. Also solve the equation for these values of k. **7**
   $x + 2y + z = 3, x + y + z = k, 3x + y + 3z = k^2$.
   (c) Find z-transform of { cos (ak + b) }, $k \geq 0$. **7**

5. (a) Find Inverse Z - transform of **6**

$$f(z) = \frac{2z^2 - 10z + 13}{(z-3)^2 (z-2)}, \quad 2 < |z| < 3$$

   (b) Find Fourier series Expansion of $f(x) = 4 - x^2$ in (0, 2), hence deduce. **7**

$$\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \ldots.$$

(c) Find the non-singular matrixes P and Q such that $A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$ is reduced to the normal form PAQ. Also find its rank. 7

6. (a) Find Laplace transform of –
$(1 + 2t - 3t^2 + 4t^3)\, H(t-2)$ 6

(b) Obtain Fourier series expansion of
$f(x) = \sqrt{1-\cos x}$ in $(0, 2\pi)$ 7

(c) Solve $(D^2 - 3D + 2)\, y = 4e^{2t}$, with $y(0) = -3$ and $y'(0) = 5$. 7

7. (a) Find z-transform of $\sin\left(\frac{k\pi}{4} + a\right)$. 6

(b) Obtain complex form of Fourier series for $f(x) = e^{bx}$ in $(0, b)$. 7

(c) Evaluate–

(i) $\int_0^\infty e^{-3t} \cos^3 t \, dt$ 3

(ii) $L[\sin 2t \cdot \cos t \cdot \cosh 2t]$ 4

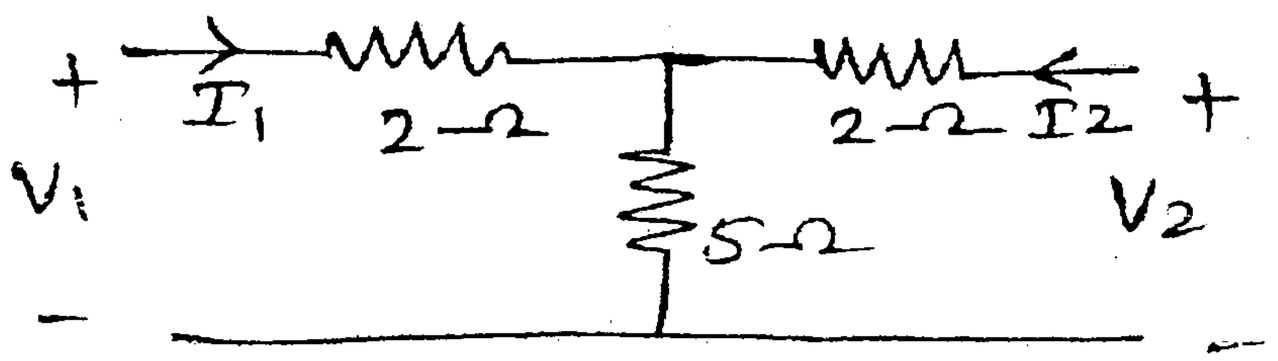
S.E sem III old M-14 EXTC
subj- EN

(OLD COURSE) **QP Code : MV-18048**

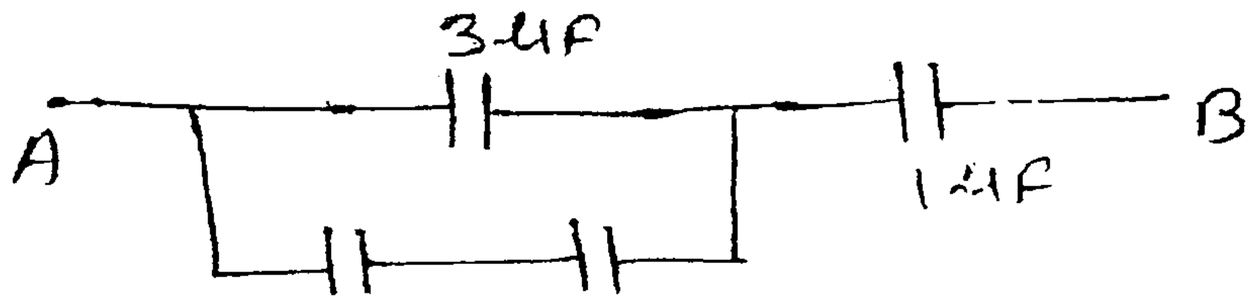
(3 Hours) **[Total Marks : 100**

N. B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** from the **remaining** questions.
(3) **Assume** suitable **data**, if **required**.

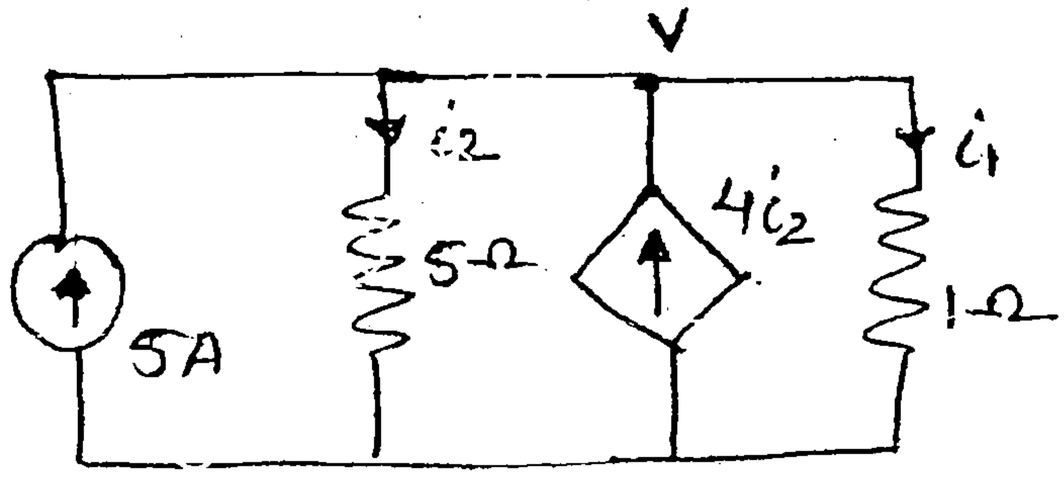
1. (a) For the given network find out z parameters and verify the condition of reciprocity. **5**



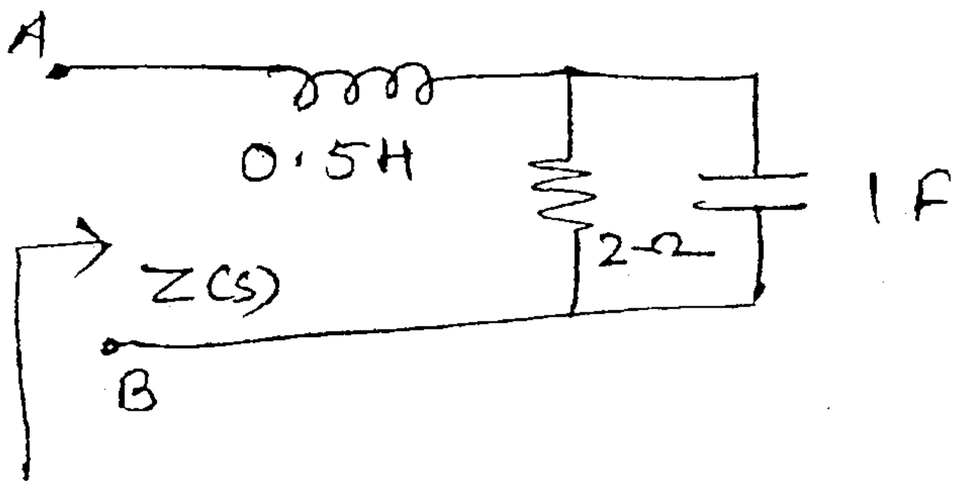
(b) Find the equivalent capacitance between A and B. **5**



(c) Find current i_1 and i_2 in the given circuit. **5**



(d) For the given network find the driving point impedance. **5**



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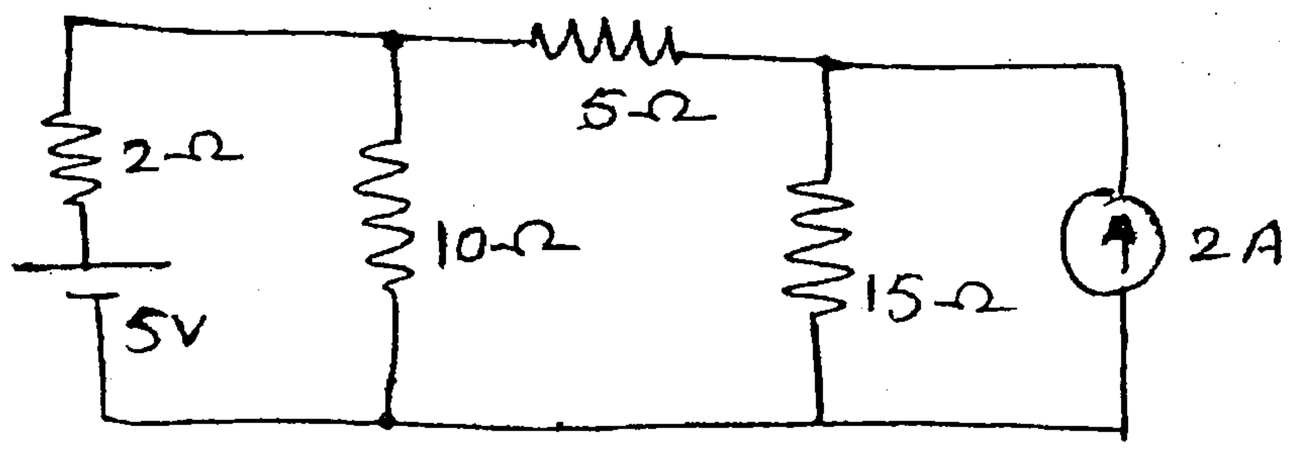
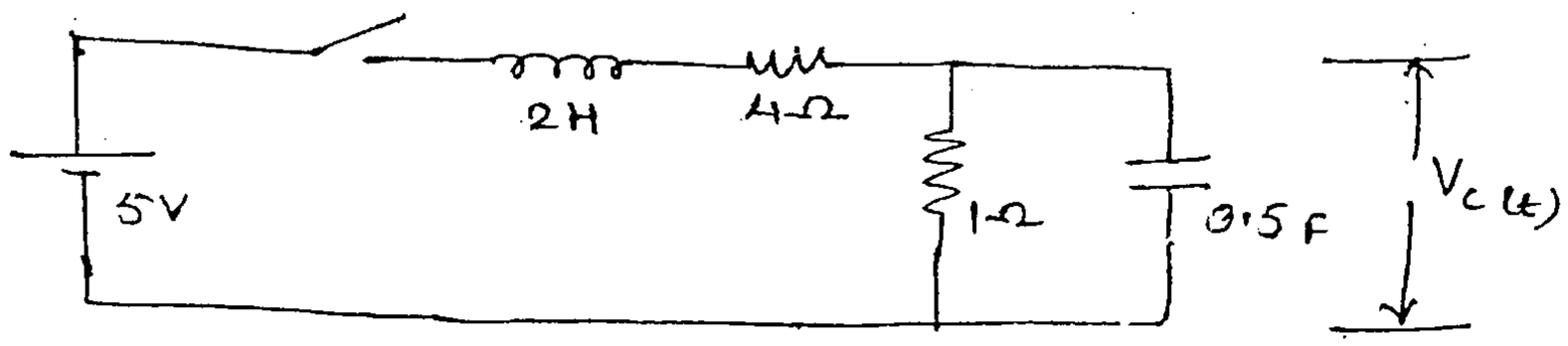
Con. 13972-14.

2. (a) State Thevenin's theorem and find the power dissipated in the 10Ω resistance. **10**



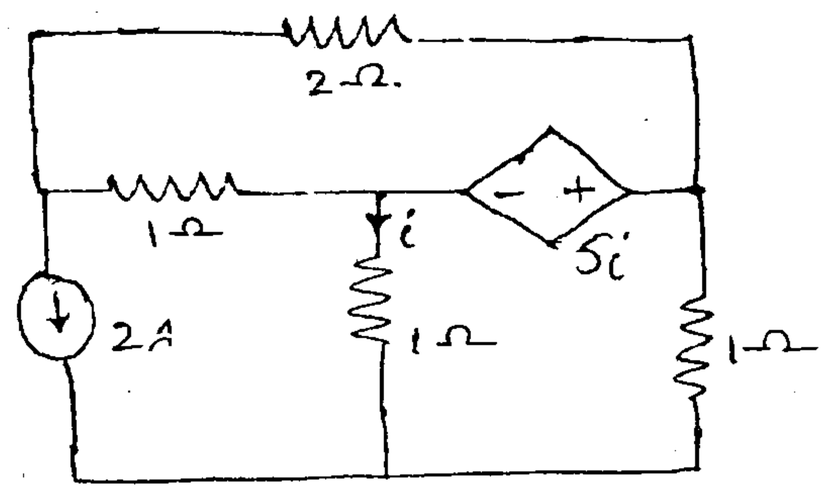
(b) Initially switch is open. At t=0, switch is closed. Find the expression for Vc(t) and hence draw the waveform for Vc(t). **10**



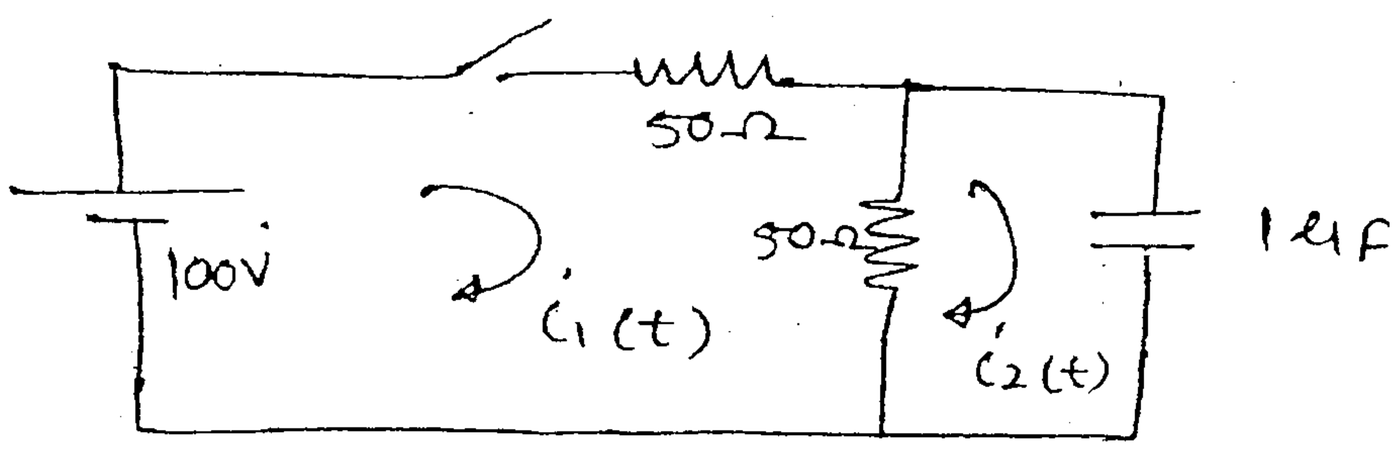
3. (a) Realize using Foster-I and Foster-II **10**

$$Y(s)=\frac{s(s^2+2)(s^2+4)}{(s^2+1)(s^2+3)}$$

(b) Using mesh analysis find the magnitude of dependent voltage source and current through 2Ω. **10**



4. (a) Initially switch is open. At t=0, switch is closed. Calculate current i_1 and i_2 for t > 0 using laplace transform. **10**



(b) Test if the polynomials are Hurwitz 5

(i) $s^3 + 6s^2 + 12s + 8$

(ii) $s^4 + 4s^3 + 8s^2 + 16s + 32$

(c) Check the following function for positive real function. 5

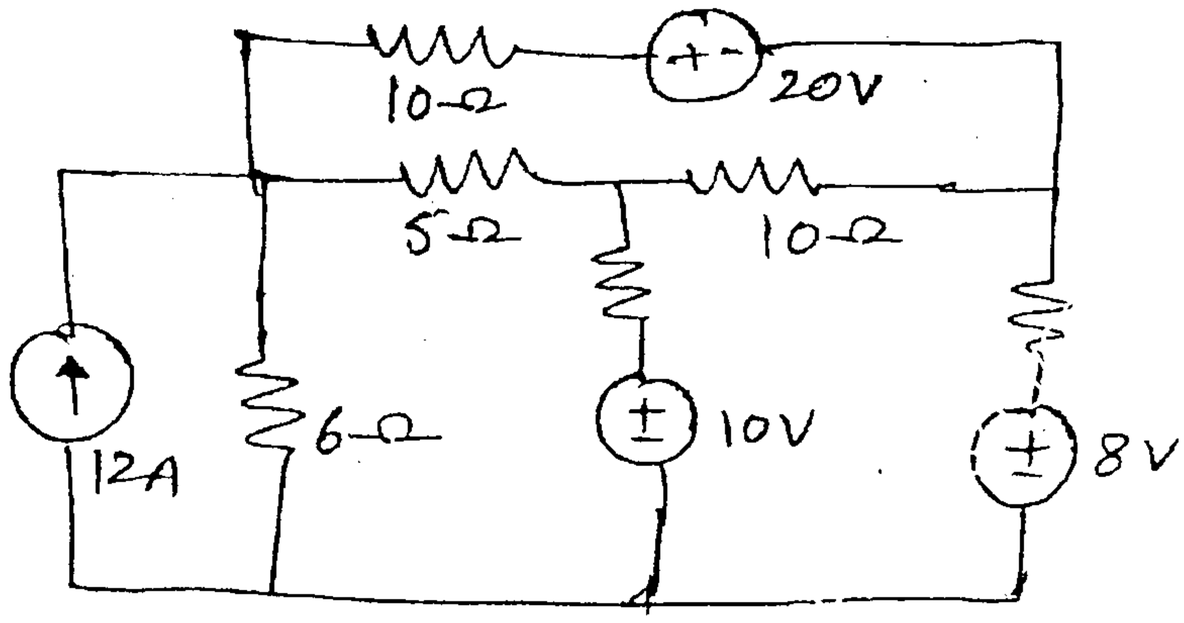
$$z(s) = \frac{s(s^2+3)}{s^2+1}$$

5. (a) For the given circuit draw tree and find out :- 10

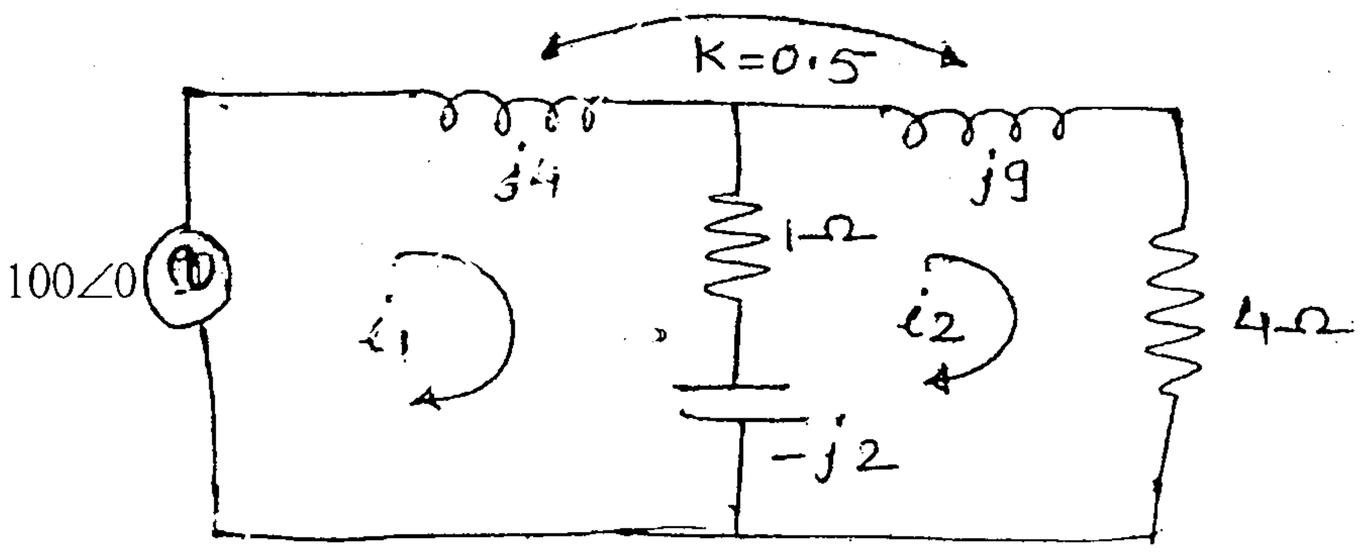
(i) Cut set matrix

(ii) Tie set matrix

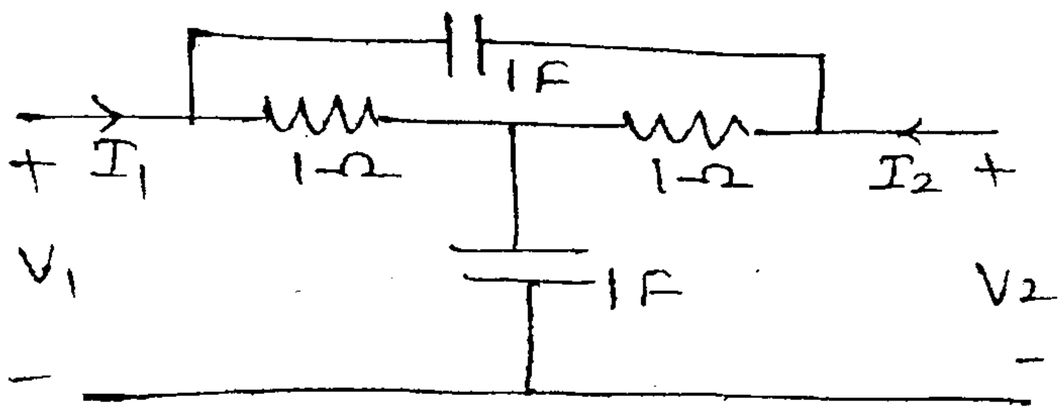
(iii) Incidence matrix



(b) Find the current i_1 and i_2 for the magnetically coupled circuit. 10



6. (a) Find y parameters for the given network. 10



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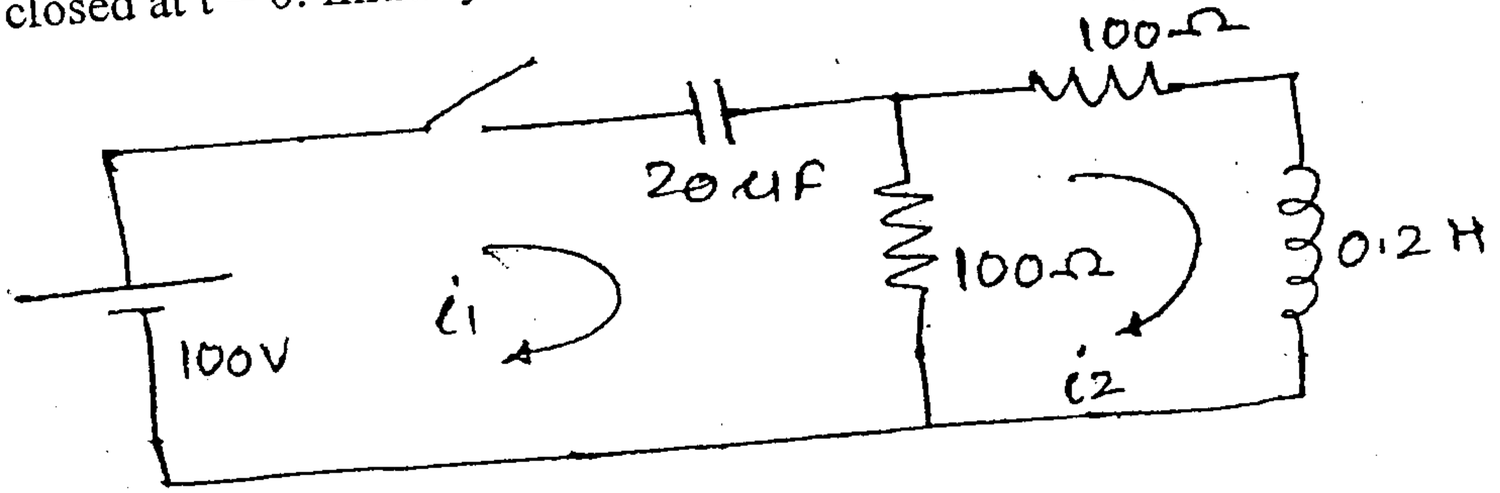
(b) For the network calculate $i_1, i_2, \frac{di_1}{dt}, \frac{di_2}{dt}, \frac{d^2i_1}{dt^2}, \frac{d^2i_2}{dt^2}$ at $t = 0^+$. Switch is closed at t = 0. Initially switch is open. 10



10

7. (a) Define PRF and write down its properties. 10
   (b) Verify reciprocity and symmetry condition for h parameter and ABCD parameters.

S.G. EXTC Sem III OTR M-14

SUB - EDRC-I

22/5/14

(OLD COURSE) **QP Code : MV-17910**

3 Hours) [Total Marks :100

N.B. : (1) Question No. **1** and **2** are **compulsory.**
(2) Out of **remaining** questions attempt any **three** questions.
(3) In all **five** questions to be attempted.
(4) **Figures** to the **right** indicate full marks.

1. (a) Design for Supply voltage V_{CC}, Collector resistor RC, Emitter resistor RE, voltage divider biasing resistor R1 & R2 of a single stage RC coupled CE audio amplifier for peak output voltage of 2V at 10kΩ load, Av 2 ≥100 and S1co:≤ 10. **20**

2. (a) Design singte stage RC coupled common source (CS) audio amplifier employing JFET type BFW11 typical to provide a voltage gain of Av ≥12 at peak output voltage of Vo 4.5V, load resistor of 120kΩ, supply voltage of 20 V with biasing circuit to provide mid-point biasing. **15**

(b) For the above designed circuit with source resistor 'RS' unbypassed, determine voltage gain, and output voltage for input voltage of 20Vpp. **5**

3. (a) Design a full wave rectifier de supply using center tapped transformer with two diodes to give dc output voltage at 150 volts to a variable resistive load. The load current expected is 50±10 mA with ripple factor not to exceed 0.07. Use CLC filter. **10**

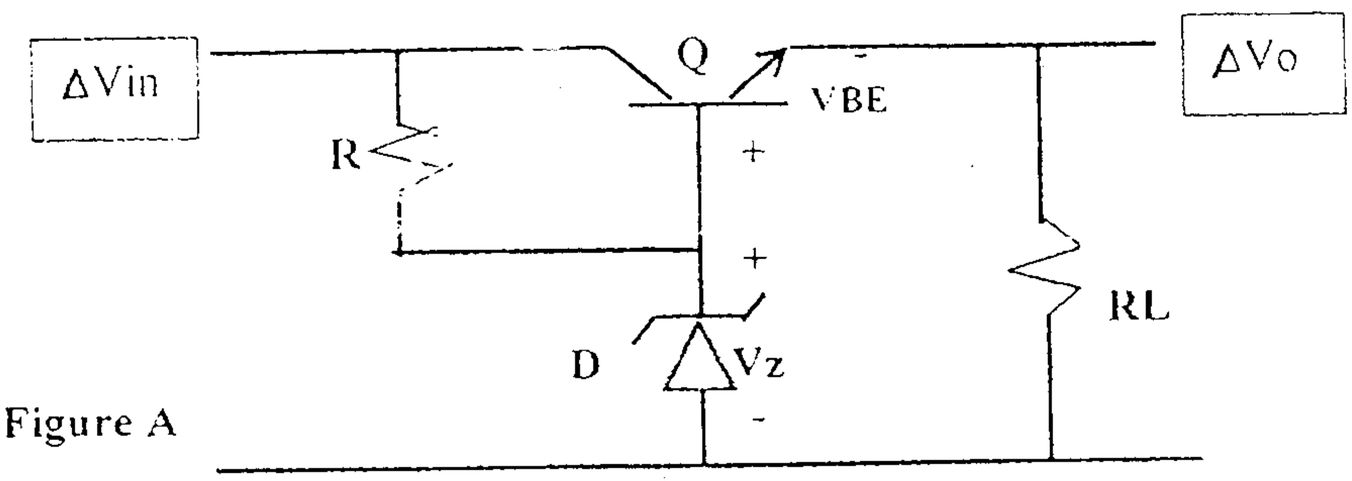


Figure A

3. (b) Explain operation of the circuit shown in Figure A with detailed function of resistor 'R', Zener diode 'D', and B.JT 'Q' and derive for load and line regulation. **10**

4. (a) Multiple Choice Question 2

(i) Voltage gain of a common gate amplifier with $\mu = 15$, rd =20 K, RL = 2K, internal resistance of the voltage source =2 K is

(a) 0.64 (b) 6.4 (c) 0.89 (d) 0.9

(ii) When transistors are used in digital circuits they usually operate in the: 2

(a) Active region (b) Break down region
(c) Saturation region (d) Saturation & cut-off region

(iii) The ratio between output and input voltage of a ideal emitter follower amplifier is 2

(a) Always unity (b) Always positive and unity
(c) Always negative and unity (d) Less than unity

(iv) Introducing a resistor in the emitter of a common emitter amplifier stabilizes the dc operating point against variations in: 2

(a) Only the temperature (b) Only the of the transistor
(c) Both temperature and β (d) None of the above

(v) BJT used as common base amplifier provides. 2

(a) High current gain (b) High input impedance
(c) High voltage gain (d) Low output impedance

4. (b) Explain the following (Any **two**) 10

(i) Graphical determination of FET parameters
(ii) Features of IGBT
(iii) BJT as a switch
(iv) Power MOSFET

5. (a) Discuss, using the concept of a load line superimposed on the transistor characteristics, how simple common emitter circuit can amplify a time varying signal 10

5. (b) The following parameters are obtained from certain JFET data sheet: 10
$V_{GSoff} = -8$ V and $I_{DSS} = 5$ m A. Determine the values of I_D, for each value of V_{GS} ranging from 0 V to - 8 Vin 1 V steps. Plot the transfer characteristic curve for the same data

6. (a) For the network shown in Figure B, determine the following with $|V_{BEon}| = 0.7V$ and $\beta = 100$ 10

(i) I_{CQ} and I_{EQ}
(ii) Input & Output impedance
(iii) Voltage gain
(iv) Current gain
(v) List disadvantages of circuit shown

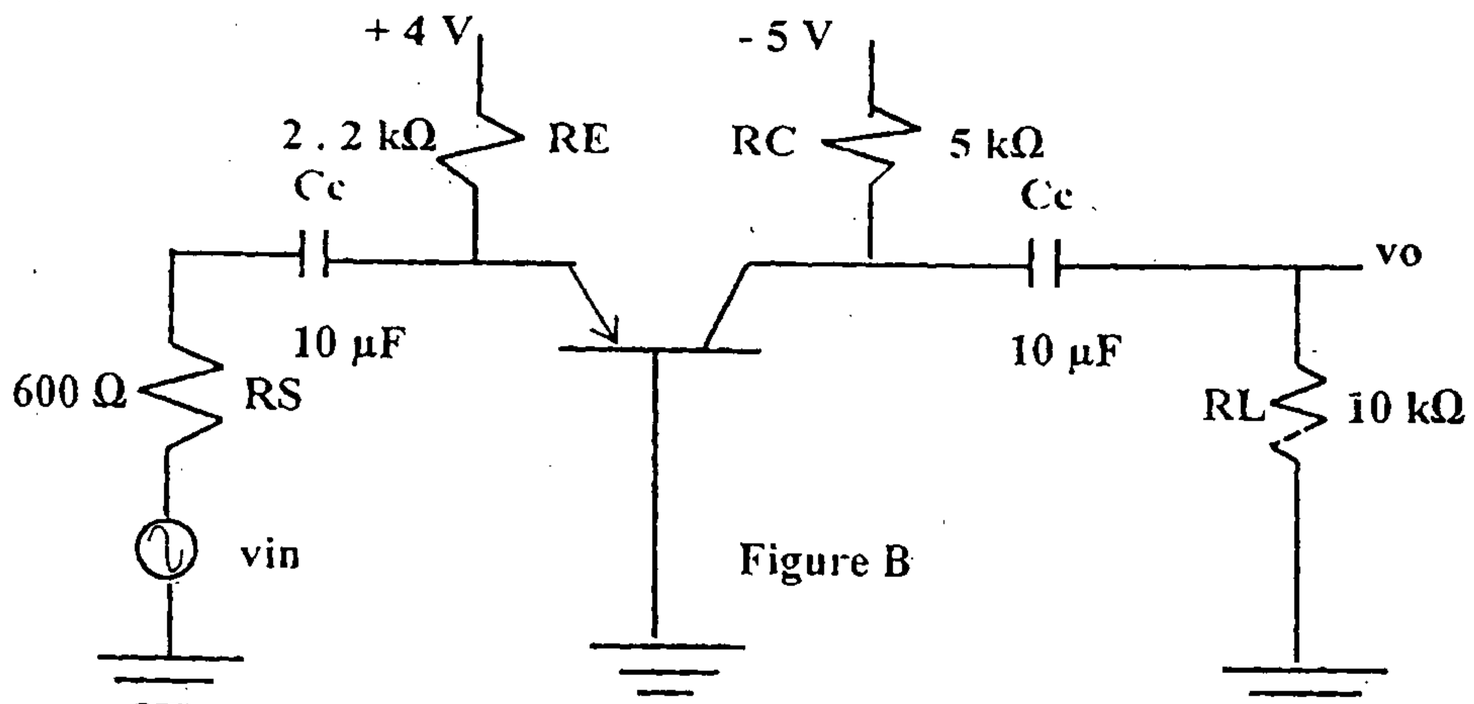


Figure B

6. (b) Determine the small signal voltage gain of a MOSFET circuit with VGSQ = 2.12 V, VDD=+5V, Rd=2.5 kΩ, V_{TN}= 1 V, Kn=0.8 mA/V² and λ =0.02 V^{-1} (body effect coefficient). Assume transistor (Figure C) is biased in the saturation region. 10

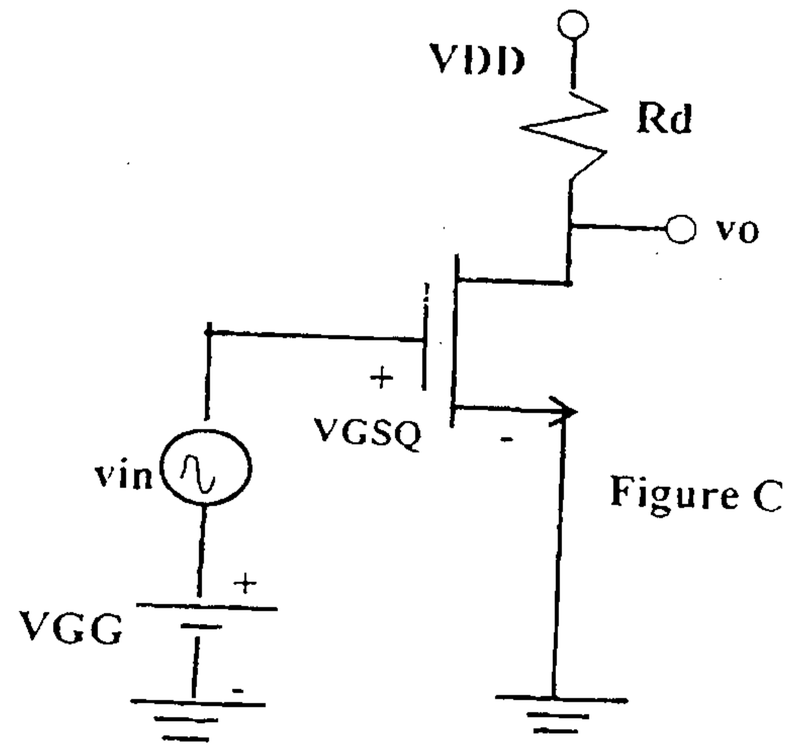


Figure C

7. (c) Explain in brief 10
(i) Line & Load regulation of BJT shunt regulator
(ii) UJT characteristic
(iii) Forward characteristic of SCR
(iv) How do we bias JFET against device variation.

QP Code : MV-17910

DATA SHEET

Pdmax @ 25°C Watts	*Icmax @ 25°C Amps*	*$V_{CE}^{(sat)}$ volts d.c.*	*V_{CBO} volts d.c.*	*V_{CEO} (Sus) volts d.c.*	*V_{CER} (Sus) volts d.c.*	*V_{CEX} volts d.c.*	*V_{BEO} volts d.c.*	*T_j max °C*	*D.C. current gain min*	*typ.*	*max.*	*Small Signal min.*	*typ.*	*h_{fe} max.*	*V_{BE} max.*	*θ_{fc} °C/W*	*Derate above 25°C W/°C*
115·5	15·0	1·1	100	60	70	90	7	200	20	50	70	15	50	120	1·8	1·5	0·7
50·0	5·0	1·0	60	50	55	60	5	200	25	50	100	25	75	125	1·5	3·5	0·4
30·0	4·0	1·0	50	40	—	—	8	150	30	50	110	33	60	115	1·2	4·0	0·3
5·0	0·7	0·6	70	60	65	—	6	200	50	90	280	50	90	280	0·9	35	0·05
0·25	0·1	0·25	50	45	50	—	6	125	115	180	220	125	220	260	0·9	—	—
0·225	0·5	0·25	85	30	—	—	—	100	35	—	65	—	45	—	—	—	—
0·25	0·1	0·25	50	45	50	—	6	125	200	290	450	240	330	500	0·9	—	—

hie	*hoe*	*hre*	*θja*
2·7 K Ω	18μ ℧	1·5 × 10^{-4}	0·4°C/mw
1·4 K Ω	25μ ℧	3·2 × 10^{-4}	—
4·5 K Ω	30μ ℧	2 × 10^{-4}	0·4°C/mw
500 Ω	—	—	—
250 Ω	—	—	—
100 Ω	—	—	—
25 Ω	—	—	—

BFW 11—JFET MUTUAL CHARACTERISTICS

–Vds volts	0·0	0·2	0·4	0·6	0·8	1·0	1·2	1·6	2·0	2·4	2·5	3·0	3·5	4·0
Ids max. mA	10	9·0	8·3	7·6	6·8	6·1	5·4	4·2	3·1	2·2	2·0	1·1	0·5	0·0
Ids typ. mA	7·0	6·0	5·4	4·6	4·0	3·3	2·7	[illegible]	0·8	0·2	0·0	0·0	0·0	0·0
Ids min. mA	4·0	3·0	2·2	1·6	1·0	0·5	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0

FET

	V_{DS} max. Volts	*V_{DG} max. Volts*	*V_{GS} max. Volts*	*P_d max. @25°C*	*T_j max.*	*I_{DSS}*	*g_{mo} (typical)*	*$-V_P$ Volts*	*r_d*	*Derate above 25°C*	*θ_{ja}*
	50	50	50	300 mW	175°C	2 mA	3000 μ ℧	6	50 KΩ	2 mW/°C	0·59°C/mW
al)	30	30	30	300 mW	200°C	7 mA	5600 μ ℧	2·5	50 KΩ	—	0·59° C/mW

Con. 11491-14.

SE | EXTC | III OLD.

DLD 28|5|2014

(OLD COURSE) QP Code : **MV-17948**

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

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

1. (a) Find binary, octal and hexadecimal equivalent for the following numbers : **4**
   (i) $(23)_4$ (ii) $(61)_{10}$
   (b) Perform the following subtraction using TWO's complement method :— **4**
   (i) $(11011)_2 - (10101)_2$ (ii) $(17)_{10} - (12)_{10}$
   (c) Explain how Hamming code can be used as error correction code. **4**
   (d) Express the following numbers in Gray code :— **4**
   (i) $(45)_{10}$ (ii) $(11010111)_2$
   (e) Draw AND, OR, NOT and Ex OR gates using NAND gates. **4**

2. (a) Design a lockout free Mod 10 Synchronous Up counter using MS-JK Flip Flop. **10**
   (b) Draw a Two input TTL NAND gate circuit. Discuss the operation and draw its transfer characteristics. **10**

3. (a) Convert SR Flip Flop to JK and JK Flip Flop to D. **10**
   (b) Find the reduced logical expression using Quine McClusky method. **10**
   $F(A,B,C,D) = \Sigma m(0,2,4,5,6,7,8,9,10,12,14)$.

4. (a) For the following function find the reduced expression in SOP form and implementusing NAND gates only :— **10**
   $F(A,B,C,D) = \Sigma m(0,1,2,3,5,7,10,13,15)$
   (b) Design full Subtractor using decoders. **10**

5. (a) Explain the following characteristics with respect to logic families :— **10**
   Propagation Delay, Noise margin, Current parameters, Fan in and Fan out
   (b) Impiement $F(A,B,C,D) = \Sigma m(0,1,2,3,4,5,7,9.10,13,15)$ using — **10**
   (i) one 8 : 1 multiplexer and (ii) 4 : 1 multiplexers tree.

6. (a) Design a circuit which will convert 4 bit Binary numbers to Gray numbers. **10**
   (b) Use PAL to implement the following functions :— **10**
   $F_1(A,B,C,D) = \Sigma m(0,1,5,6,8,11,14)$
   $F_2(A,B,C,D) = \Sigma m(0,1,5,6,8,11,14,15)$

7. Write short notes on (any **four**) :— **20**
   (a) Weighted and unweighted codes and their applications
   (b) Digital comparator
   (c) Boolean Algebra
   (d) Shift Registers
   (e) Universal Properties of NAND and NOR gates
   (f) PLA.
