Sem III Elex (Rev) 31/05/14

E·D

QP Code : **NP-18616**

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

N. B. : (1) Question No. **1** is compulsory and solve **any three** questions from remaining questions.
(2) Assume suitable data if necessary.
(3) Draw neat and clean figures.

Given Data —

(1) $q = 1.6 \times 10^{-19}$ C
(2) $k = 1.38 \times 10^{-23}$ J/K
(3) $ni = 1.5 \times 10^{10}$ cm^{-3}
(4) $\epsilon si = 11.7 \times 8.854 \times 10^{-14}$

1. (a) What is Non-ideal effects in BJT and hence explain Base width modulation in brief. **5**

1. (b) Justify how phototransistor is more practical than photo diode. **5**

1. (c) Explain in brief TWO Terminal MOS structure. **5**

1. (d) Explain construction and characteristics of UJT. **5**

2. (a) Explain concepts, construction, characteristics and working of Gunn diode. **10**

2. (b) Explain basic principle of operation of BJT with the help of construction, minority carrier distribution and energy band diagrams. **10**

3. (a) Explain structure and operation of MOSFET considering different cases of threshold voltage V_T. **10**

(b) An abrupt PN junciton has dopant concentrations of **10**
$Na = 2 \times 10^{16}$ cm^{-3} and $Nd = 2 \times 10^{15}$ cm^{-3} at T = 300 K
Calculate: (a) Vbi
(b) W at $V_R = 0$ and $V_R = 8V$
(c) E maximum at $V_R = 0$ and $V_R = 8V$

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4. (a) What is photovoltaic effect. Explain in detail Solar Cell with working, characteristics and practical applications. 10

4. (b) For an n-channel MOS transistor with 10
$\mu n = 600\ cm^2/V.S$, $Cox = 7 \times 10^{-8}\ F/cm^2$,
$W = 20\mu m$, $L = 2\mu m$ and $VTO = 1.0\ V$.
Examine the relationship between the Drain current and terminal voltages.

5. (a) Explain construction, working and characteristics of TRIAC & DIAC. 10

5. (b) Explain schottky-barrier diode with the help of energy band diagram. 10

6. (a) What is HBT, Explain construction and energy band diagram of HBT. 10

6. (a) Explain difference between N-channel and P-channel JFET, Also explain characteristcs (Drain and Transfer) for N-channel JFET. 10

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SE (ELEX, ET) Sem III (CBSGS)

AM - III

22.05.14.

QP Code : **NP-18646**

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

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

1. (a) Evaluate $\int_0^\infty \frac{(\cos 6t - \cos 4t)}{t}\,dt$ **5**

(b) Obtain complex form of fourier series for $f(x) = e^{ax}$ in $(-1, 1)$ **5**

(c) Find the work done in moving a particle in a force field given by $\vec{F} = 3xy\,\hat{i} - 5z\hat{j} + 10x\hat{k}$ along the curve $x = t^2 + 1$, $y = 2t^2$, $z = t^3$ from $t = 1$ to $t = 2$. **5**

(d) Find the orthogonal trajectory of the curves $3x^2y + 2x^2 - y^3 - 2y^2 = \alpha$, where α is a constant. **5**

2. (a) Evaluate $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} - 3y = \sin t$, $y(o) = 0$, $y'(o) = 0$, by Laplace transform **6**

(b) Show that $J_{5/2} = \sqrt{\frac{2}{\pi x}}\left[\frac{3 - x^2}{x^2}\sin x - \frac{3}{x}\cos x\right]$ **6**

(c) (i) Find the constants a, b, c so that **4**
$\vec{F} = (x + 2y + az)\hat{i} + (bx - 3y - z)\hat{j} + (4x + (y + 2z)\hat{k}$ is irrotational.

(ii) Prove that the angle between two surfaces $x^2 + y^2 + z^2 = 9$ and $x^2 + y^2 - z = 3$ at the point $(2, -1, 2)$ is $\cos^{-1}\left(\frac{8}{3\sqrt{21}}\right)$ **4**

3. (a) Obtain the fourier series of f(x) given by **6**

$$f(x) = \begin{cases} 0, & -\pi \le x \le 0 \\ x^2, & 0 \le x \le \pi \end{cases}$$

(b) Find the analylic function $f(z) = u + iv$ where $u = r^2\cos 2\theta - r\cos\theta + 2$ **6**

(c) Find Laplace transform of **8**
(i) $te^{-3t}\cos 2t.\cos 3t$

(ii) $\frac{d}{dt}\left[\frac{\sin 3t}{t}\right]$

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4. (a) Evaluate $\int J_3(x)dx$ and Express the result in terms of J_0 and J_1 6

(b) Find half range sine series for 6
$f(x) = \pi x - x^2$ in $(0, \pi)$

Hence deduce that $\frac{\pi^3}{32} = \frac{1}{12} - \frac{1}{3^2} + \frac{1}{5^2} - \frac{1}{7^2} + \ldots$

(c) Find inverse Laplace transform of 8

(i) $\frac{1}{s}\tanh^{-1}(s)$ (ii) $\frac{se^{-2s}}{(s^2+2s+2)}$

5. (a) Under the transformation $w + 2i = z + \frac{1}{z}$, show that the map of the circle $|z| =$ 6
2 is an ellipse in w-plane.

(b) Find half range cosine series of $f(x) = \sin x$ in $o \le x \le \pi$. 6
Hence deduce that

$\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \ldots = \frac{1}{2}$

(c) Verify Green's theorem, for 8

$\oint_c (3x^2 - 8y^2)\,dx + (4y - 6xy)\,dy$ where c is boundary of the region defined by $x=0$, $y=0$, and $x+y = 1$.

6. (a) Using convolution theorem; evaluate 6

$L^{-1}\left\{\frac{1}{(s-1)(s^2+4)}\right\}$

(b) Find the bilinear transformation which maps the points 6
$z = 1, i, -1$ onto $w = 0, 1, \infty$

(c) By using the appropriate theorem, Evaluate the following :– 8

(i) $\int \bar{F} \cdot d\bar{r}$ where $\bar{F} = (2x - y)\hat{i} - (yz^2)\hat{j} - (y^2z)\hat{k}$
and c is the boundary of the upper half of the sphere $x^2 + y^2 + z^2 = 4$

(ii) $\iint_s (9x\hat{i} + 6y\hat{j} - 10z\hat{k}) \cdot d\bar{s}$ where s is
the surface of sphere with radius 2 units.

S.E. (Elex), Sem-III (Rev.) 03/06/2014

Circuit Theory.

QP Code : **NP-18717**

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

N. B. : (1) Question No. **1** is **compulsory.**
(2) Attempt any **three** questions from **remaining** questions.
(3) Use **Smith chart** wherever **required.**
(4) **Assume** suitable **data** if **required.**
(5) **Attempt every question in a group and not randomly.**

1. (a) Check for Hurwitz polynominal **20**

$Q(s) = s^5 + s^3 + s^1$

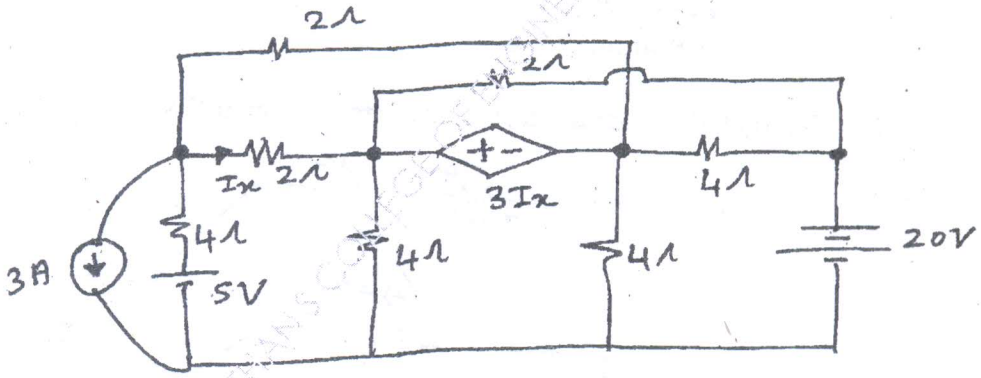
$Q(s) = s^4 + 6s^3 + 8s^2 + 10$

(b) Obtain s-domain (Laplace Transform) equivalent circuit diagram of an inductor and capacitor with initial conditions.

(c) Obtain Transmission parameters in terms of 'z' parameters.

(d) List the types of damping in a series R-L-C circuit and mention the condition for each damping.

2. (a) Obtain pover supplied by dependent voltage source **10**



(b) Compare and obtain Foster form I and form II using a example of RC ckt. **10**

$$Z(s) = \frac{(s+1)(S+6)}{s(s+4)(s+8)}$$

Also give a example of L-C and R-L ckt.

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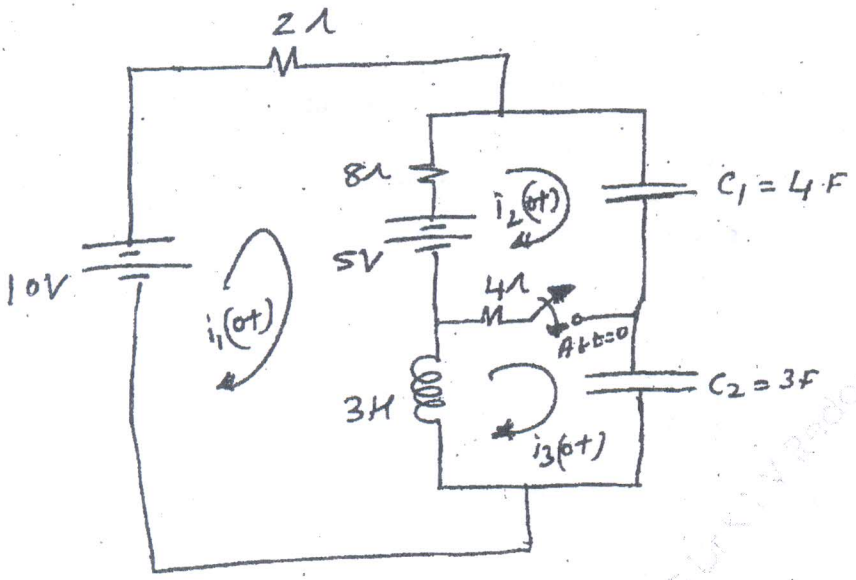
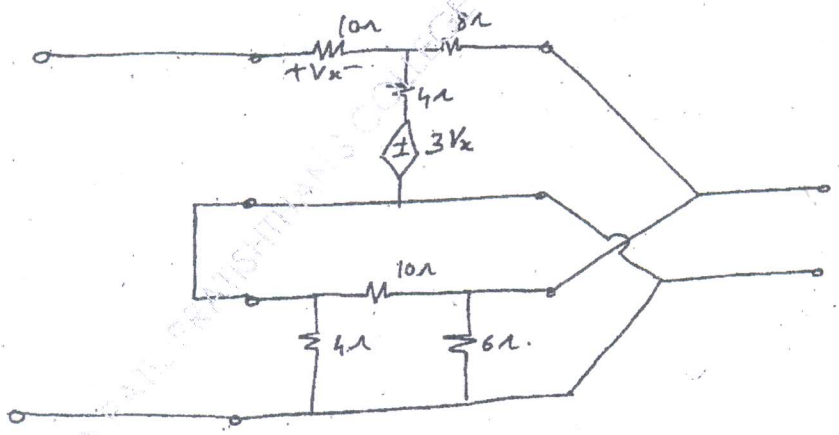
3. (a) Obtain $i_1(o+)$, $i_2(o+)$ and $i_3(o+)$ 10



(b) Design a short circuit stub match for $Z_L = 450 - 600\,j(\Omega)$ 10
for a line of $Z_O = 300\ (\Omega)$
and f = 20 MHz
use Smith charts.

4. (a) Obtain hybrid parameters of the intercorrected 'Two' 2-port networks 8



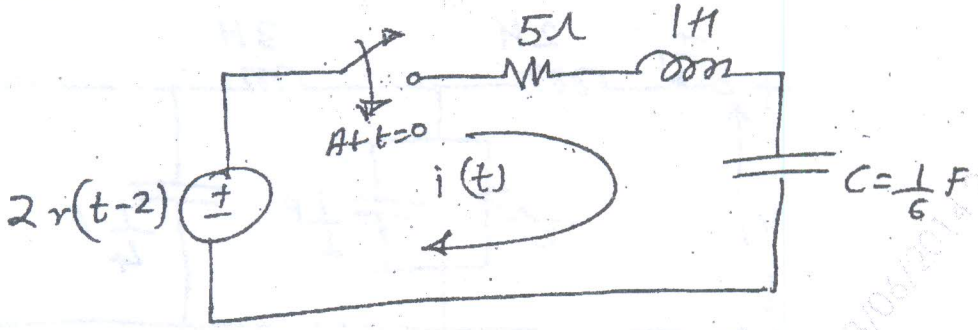
(b) Check for p.r.f. test 6

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

(c) Compare Cauer Form I and Cauer Form II of a LC Network. 6

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

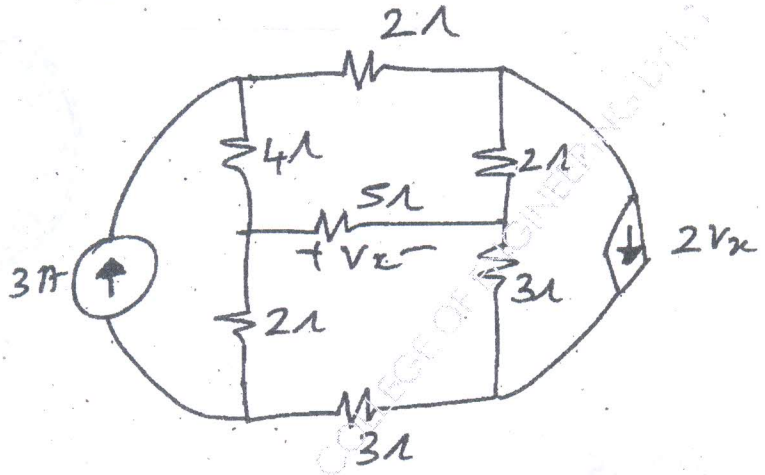
5. (a) Obtain i(t) for $t > 0$ 8



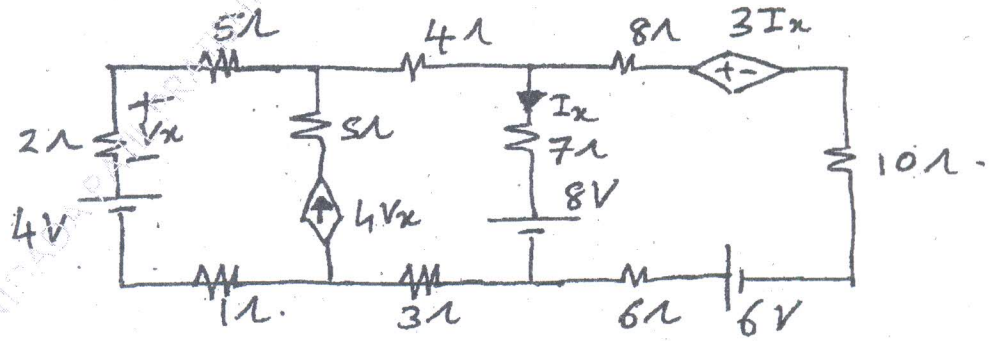
Where r(t) is a ramp signal.

(b) Derive an expression for characteristic equation of a transmission line. Also obtain α, β and γ of the line. 6

(c) Obtain V_x using some shifting and source transformation technique. 6

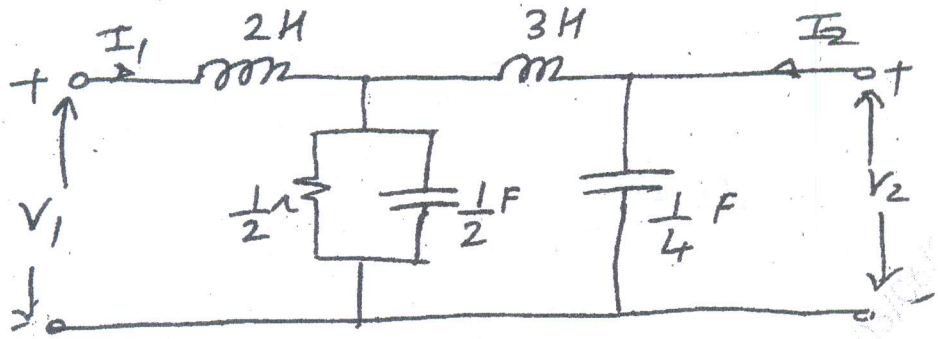


6. (a) Obtain Thevenin's equivalent circuit :- 8



Hence find current flowing through 10Ω load.

(b) Obtain $Z_{11}(s)$, $Z_{21}(s)$, $G_{21}(s)$ for the Laddar Network 8



(c) Explain various types of filters. 4

SE(ETRX) Sem III OLD 28·5·14

DCD

QP Code : NP-18678

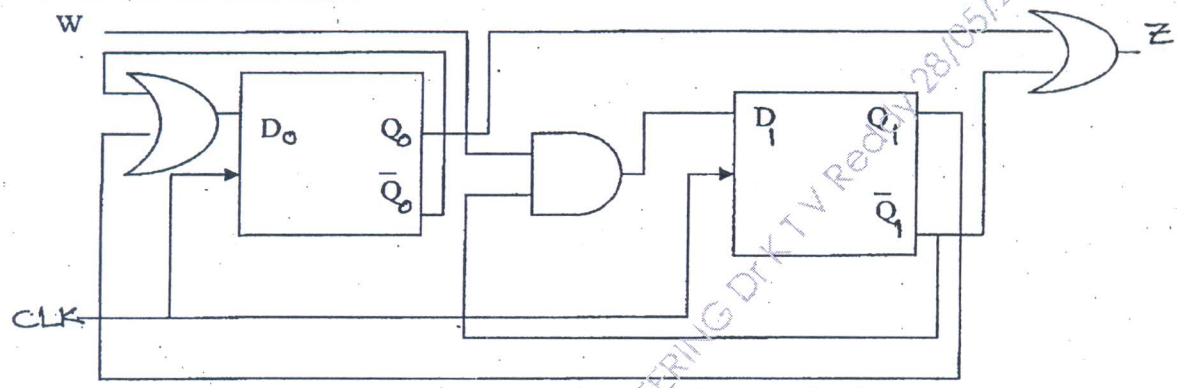
(3 Hours) **[Total Marks : 80**

N.B. : (1) Question No. **1** is **compulsory**.
(2) Solve any **three** from remaining **5** questions.
(3) Draw **neat** diagrams wherever **necessary**.

1. **(A)** Implement the following function using NOR gates only (after reduction using K map) **10**
F = π M (1,2,4,7,11,13) . d (9,15)

(B) Design a MOD 6 asynchronous counter and explain glitch problem. **10**

2. **(A)** Analyze the clocked synchronous machine given below. Write excitation equations, excitation/transition table and state /output table (Use state names A - D for Q1-Q2=00–11). Also draw the state diagram. **10**



(B) Design a 1 digit BCD adder using IC 7483 and explain the operation for $(0111)_{BCD} + (1001)_{BCD}$. **10**

3. **(A)** Write a VHDL code for 8:1 Multiplexer with active low enable input. **10**

(B) Design a mealy sequence detector to detect a sequence ----1101----using D flip-flops and logic gates. **10**

4. **(A)** Design a circuit with optimum utilization of PLA to implement the following functions **10**
F1 = ∑ m (1, 2, 3, 6, 9, 11)
F2 = ∑m (0, 1, 6, 8, 9)
F3 = ∑m (2, 3, 8, 9, 11)

(B) Implement following function using 4:1 line MUX and NAND gates. **10**
F (A, B, C, D) = ∑m (1, 2, 6, 7, 10, 12, 13)

5. **(A)** Design a 8 bit binary up counter using MSI counter IC 74163, draw a circuit diagram and explain working. **10**

(B) Eliminate redundant states and draw reduced state diagram. **10**

PS	NS		O/P
	X = 0	X = 1	Y
A	B	C	1
B	D	F	1
C	F	E	0
D	B	G	1
E	F	C	0
F	E	D	0
G	F	G	0

6. Write short notes on (Any THREE): **20**
1. XC 4000 FPGA Architecture
2. Stuck at '0' and stuck at '1' fault
3. Master Slave JK flip flop
4. 2 input TTL NAND gate

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