SE (ETRX) SEM: III (CBSGS) NOV - DEC 2013

D. C. D.
4/12/13

25-11-2013-DTP-P-7-RA-10

Con. 9591-13. **GX - 12110**

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

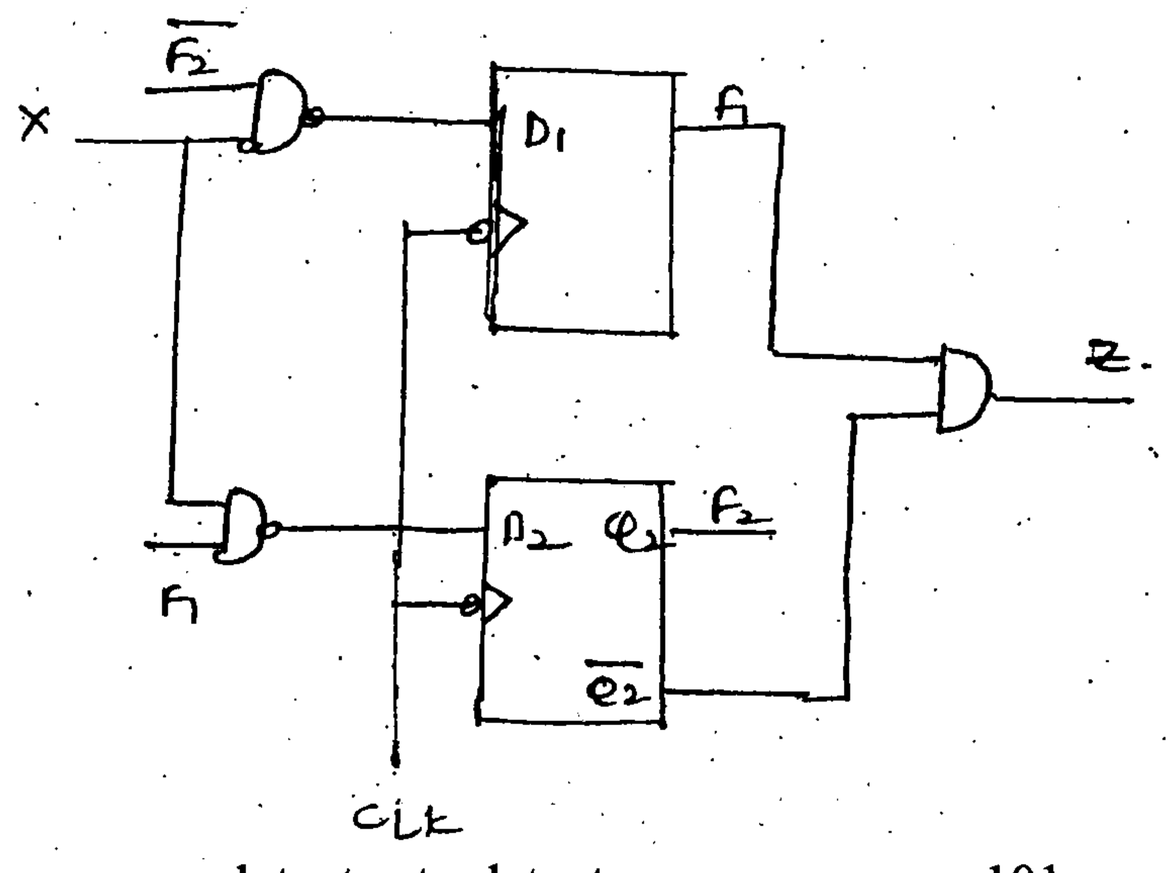
N. B. : (1) Question No. **1** is **compulsory**.
(2) Solve any **three** questions from remaining **five** questions.
(3) Draw neat **diagrams** wherever **necessary.**
(4) Furnish neat **sketches** and assume **suitable data** if required.

1. (a) Explain Moore and Mealy type of sequential circuits. **5**
(b) Draw the circuit diagram of 2-input TTL NAND gate. **5**
(c) Explain the term noise margin and its value for TTL and CMOS family. **5**
(d) Explain stuck at '0' and stuck at '1' faults. **5**

2. (a) Draw the circuit diagram of J-K F/F using NAND gates. Derive it's characteristic equation and excitation table. What is race around condition in J-K F/F and how it is avoided ? **10**
(b) Design and explain 8 bit binary adder using IC 7483. **10**

3. (a) Implement following functions using NAND gate only : **10**
(i) $F = \Sigma m (1, 2, 3, 4, 7, 11, 13) + d (9, 15)$
(ii) $F = \pi M (4, 5, 6, 7, 8, 12) + d (1, 2, 3)$

(b) Analyze the sequential state machine shown in **fig.** obtain the state diagram for the same. **10**



4. (a) Design Moore sequence detector to detect a sequence ------101------ using D F/F. **10**
(b) Discuss XC 4000 FPGA architecture with neat block diagram. **10**

[TURN OVER

5. (a) Construct ring counter using IC 74194 and draw the output waveform. **10**

   (b) Identify indistinguishable states in the following state table and obtain minimized state diagram **10**

PS	NS		OIP	
	X = o	X = 1	X = o	X = 1
1	2	3	0	0
2	2	4	0	0
3	2	3	0	0
4	5	3	0	0
5	2	6	0	1
6	5	3	0	0

6. Write a short notes on any **three** : – **20**

   (a) JTAG and BIST

   (b) VHDL

   (c) PAL AND PLA

   (d) XC 9500 CPLD family.

10/12/13 S.E. (ETRX) Sem II CBGS

Circuit Theory

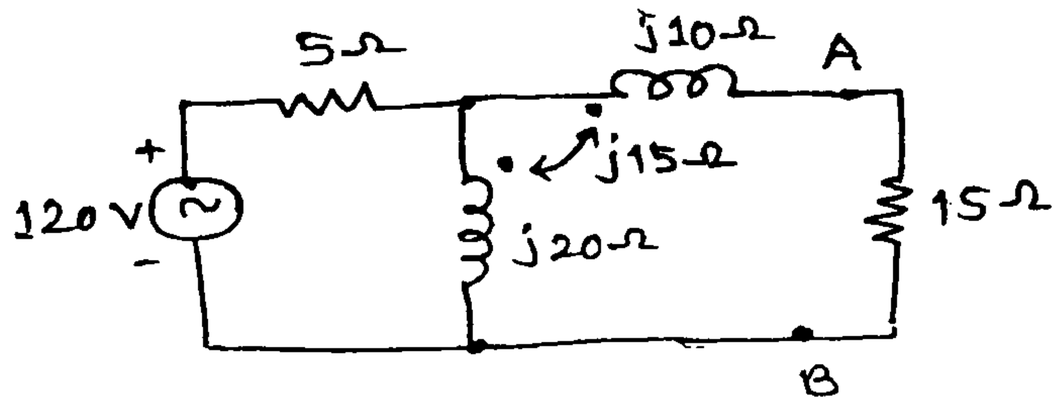
19-11-2013-DTP-P-7-RA-10

Con. 8952-13. **GX - 12149**

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

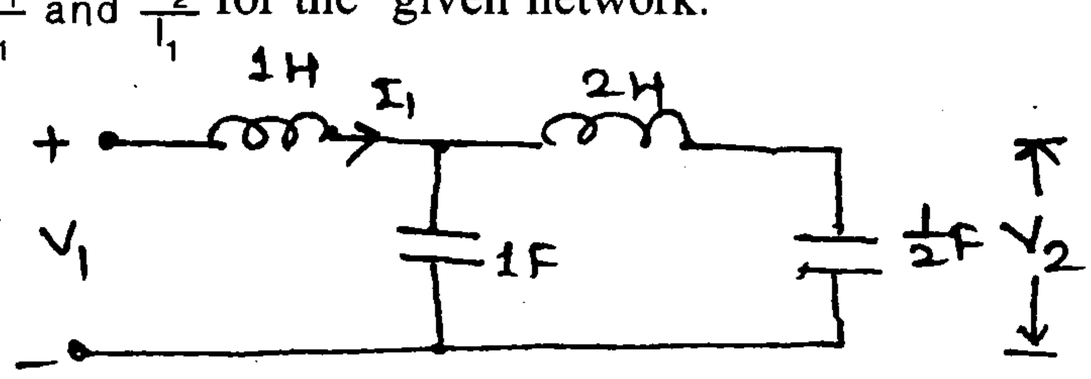
N. B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **three** questions from **remaining.**
(3) **Figures** to the **right** indicate full marks.
(4) Assume **suitable data** if required.
(5) Use Smith Chart for transmission line problems.

1. (a) Find the current through 15Ω resistor. **4**



(b) Obtain the voltage response of series R-L circuit. **4**

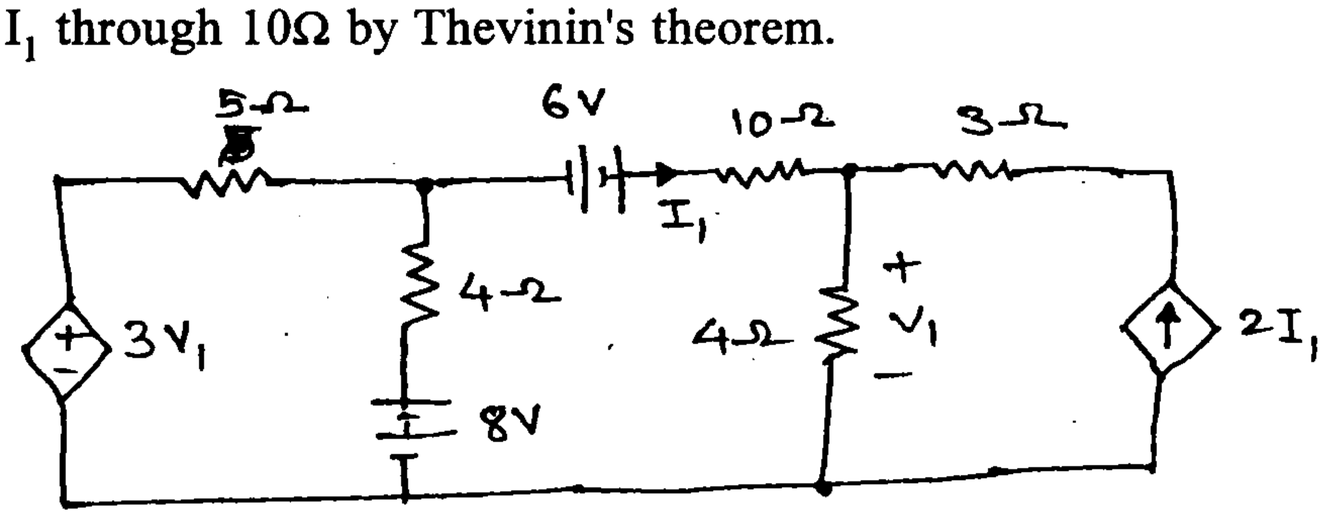
(c) Determine $\frac{V_1}{I_1}$ and $\frac{V_2}{I_1}$ for the given network. **4**



(d) What are standing waves ? Define reflection coefficient and VSWR of a transmission line. **4**

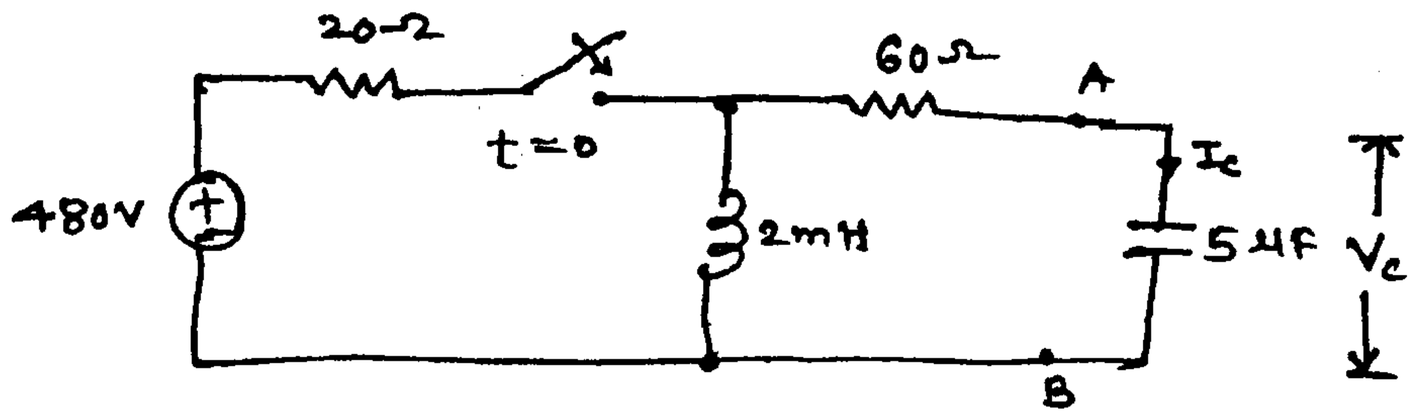
(e) A ∏–section filter network consists of a series arm conductor of 20 mH and two shunt arm capacitors of 160 nF each. **4**
Calculate : (i) cut off frequency (ii) attenuation (iii) Phase shift at 15kHz.
Also obtain the nominal impedance in pass-band.

2. (a) Find I_1 through 10Ω by Thevinin's theorem. **6**



[TURN OVER

(b) Find Ic and Vc for t > o **8**

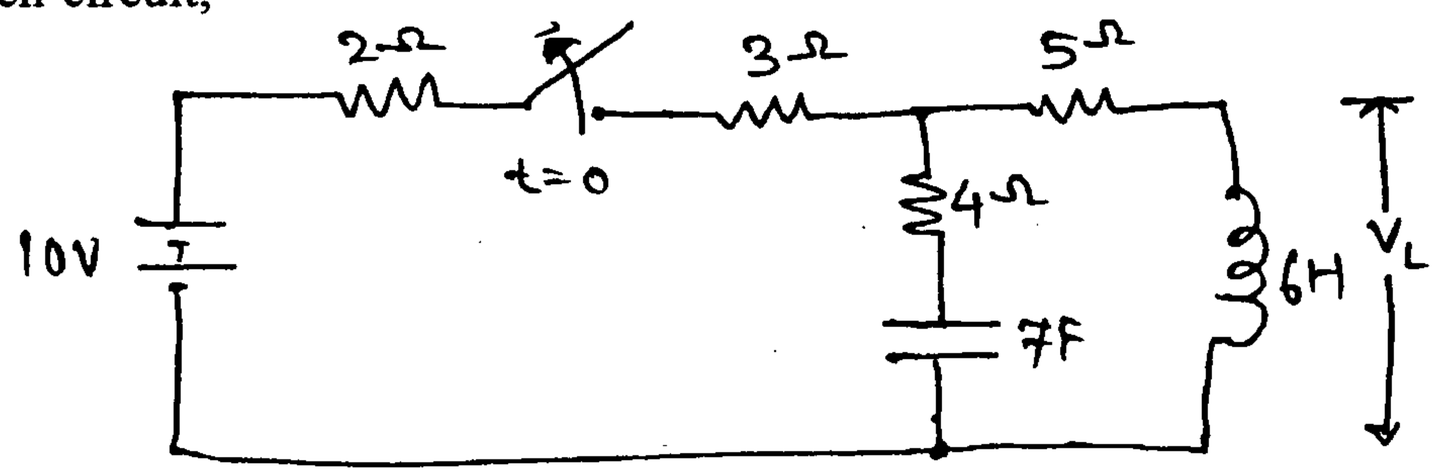


(c) Use Nodal analysis to find the voltage drop across 4 Ω and 10 Ω ref Qu. 2(a) **6**

3. (a) Design a single stub match for a load of 150 Ω + j 232.5 Ω for 75 Ω line at 500 MHz using Smith Chart. **8**
   (b) Compare foster realization with caurer realizations. **8**
   (c) State the properties of Hurwitz polynomial. **4**

4. (a) Define T-parameters and relate them to other parameter as indicated. **8**
      (i) A and C interms of z-parameters
      (ii) B interms of y-parameters
      (iii) D interms of h-parameter.
   (b) Test whether the following functions are positive real functions with proper reasons. **12**
      (i) $F_1(s) = \dfrac{2s^3 + 2s^2 + 3s + 2}{s^2 + 1}$
      (ii) $F_2(s) = \dfrac{s^2 + 1}{s(s^2 + 4)}$

5. (a) What are scattering parameters ? State their properties. **6**
   (b) Derive an expression of m-derived Π section network starting from a constant k section. **6**
   (c) For given circuit, **8**



switch 's' is opened at t=o. Switch 's' was on for long time.
Determine $V_L(o^+)$, $\frac{dV_L}{dt}(o^+)$ and $\frac{d^2V_L}{dt^2}(o^+)$

[TURN OVER

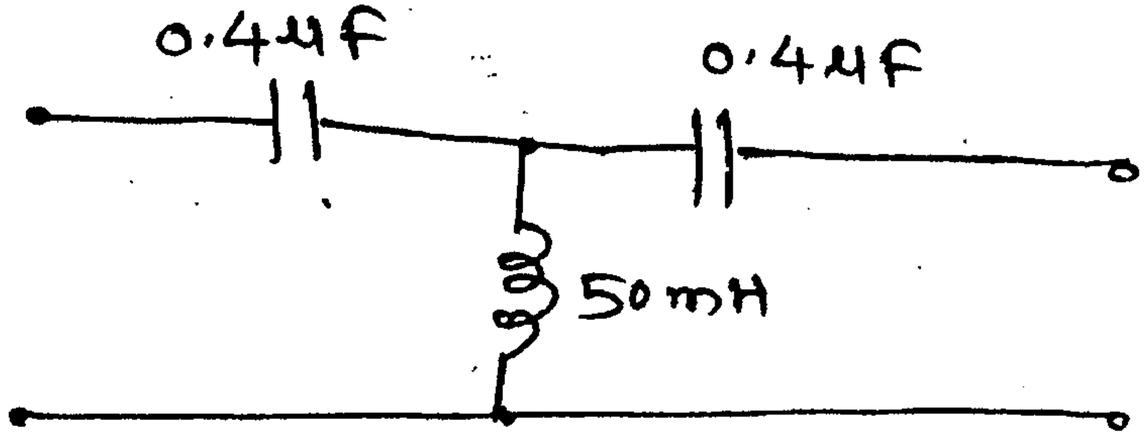
6. (a) Explain the graphical representation of series resonance circuit. **6**

   (b) Test whether following polynomials are Hurwitz **8**

   (i) $P(s) = s^4 + s^3 + 5s^2 + 3s + 4$

   (ii) $P(s) = s^6 + 6s^4 + 4s^2 + 2$

   (c) Find the characteristic impedance, cut off frequency and pass band for the network shown : **6**



(ETRX)
S. E. SEM-III (CBGS 16/12/13
Electronic Instruments and Measurement

28-11-2013-DTP-P-7-RA-6

Con. 9938-13. **GX - 12182**

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

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

1. Solve all :— **20**
   (a) Define the following terms :–
   (i) Accuracy (ii) Precision (iii) Sensitivity
   (iv) Linearity (v) Resolution.
   (b) Write the applications of Q-meters.
   (c) Estimate the Bandwidth of CRO if a signal of 12 MS rise time is observed as the signal with 15 MS rise time.
   (d) Write the selection criteria of transducer.

2. (a) Write short notes on "Resistance strain guages". **10**
   (b) List the types of liquid level measurements. Explain any two in detail. **10**

3. (a) Compare the temperature measurement transducers RTD, thermistors and thermcouples on the basis of principle, characteristics, ranges and applications. **10**
   (b) Explain the magnetic flow meter in detail. **10**

4. (a) Draw and explain the block diagram of data logger. **10**
   (b) Explain the measurement of unknown resistance using Kelvin double bridge. **10**

5. (a) Draw and explain the generalized block diagram of the CRO. **10**
   (b) Explain the linear variable differential transformer in detail. **10**

6. (a) What are the types of errors in measurements ? Explain all in details. **10**
   (b) Draw and explain the block diagram of digital storage oscilloscope. Also write the applications of DSO. **10**

S.E. ETRX sem III CBGS Nov-13 25/11/13

Sub:- Electronics Devices

Con. 7851-13. **GX-12037**

(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 :–

$q = 1.6 \times 10^{-19}$ C

$k = 1.38 \times 10^{-23}$ J/K

$\eta i = 1.5 \times 10^{10}$ cm^{-3}

$\epsilon_{si} = 11.7 \times 8.854 \times 10^{-14}$

1. (a) Justify that the space charge width increase with reverse biased voltage in a p–n junction diode. **5**

(b) Sketch low frequency capacitance versus gate voltage of a MOS capacitor with n–type substrate show individual capacitance components. **5**

(c) Sketch the IV characteristics of a PN junction solar cell. **5**

(d) Describe construction and V–I characteristics of IGBT. **5**

2. (a) Derive equation of built in potential Vbi for a p– n junction under Zero bias and hence calculate Vbi at T = 300 k for Nd = 10^{15} cm^{-3} and Na = 10^{15} cm^{-3}. **10**

(b) What is primary advantage of HBT over BJT? Draw and explain schematic cross section of an npn HBT structure with its energy band diagram when HBT is operated under active mode? **10**

3. (a) Explain construction and V–I characteristics of Tunnel diode. **10**

(b) Explain construction, working and characteristic of N–channel JFET, explain frequency limitation factors. **10**

TURN OVER

4. (a) Draw band diagrams for accumulation, depletion and inversion regions for MOS capacitor. **10**
Calculate threshold voltage for a polysilicon gate n–channel MOS transistor with substrate at Zero potential with the following parameters :–
Substrate doping density $N_A = 10^{16}\ cm^{-3}$
Polysilicon gate doping density $N_D = 2 \times 10^{20}\ cm^{-3}$
Gate oxide thickness $t_{ox} = 500^0\ A$
Oxide–interface fixed charge density $N_{ox} = 4 \times 10^{10}\ cm^{-2}$

(b) Describe the time delay factors in the frequency limitation of the bipolar transistor, calculate the emitter–collector transit time, cut off frequency and the beta cut off frequency of a bipolar transistor, with the following parameters, consider a silicon npn transistor at T = 300 K with a low frequency common emitter current gain of $\beta = 100$. Assume the following parameters :– **10**

$IE = 50\mu A, C_{je} = 0.40\,PF, C\mu = 0.05\,PF$

$X_B = 0.5\,\mu m, D_n = 25\,cm^2/s, X_{dc} = 2.4\,\mu m$

$r_C = 20\Omega, C_S = 0.1\,\rho F$

5. (a) Describe construction, working and characteristic of :– **10**
(i) Photodiode and
(ii) Avalanche Photodiode.

(b) Discuss the device structure and principle of operation of MESFET. Derive the equation for current–voltage characteristics for MESFET. Describe the various regions of operation on V–I characteristics. **10**

6. (a) Explain construction, working and characteristics of SCR. **10**

(b) Explain the need of Hetero junction, explain the terms straddling, staggered and broken gap in relation to hetero junction. Explain the quantization of energy of an electron in a potential well in hetero junction. Explain this concept with respect to the ideal energy band diagram of an nN Ga As–Al Ga As hetero junction in thermal equilibrium. **10**

S.E. ETRX & EXTC Sem III CBGS Nov-13
Sub:- AM-III
29/11/13

Ash5-D:\Data-44

Con. 7885-13. **GX-12071**

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

N.B. : (1) Question no. **1** is **compulsory**.
(2) Attempt any **three** questions out of the remaining **five** questions.
(3) **Figures** to **right** indicate **Full** marks.

1. (a) Prove that real and imaginary parts of an analytic function $F(z) = u + iv$ are harmonic function. **5**

(b) Find fourier series for $f(x) = |\sin x|$ in $(-\Pi, \Pi)$. **5**

(c) Find the Laplace transform of $\int_0^t ue^{-3u} \sin 4u\,du$ **5**

(d) If $\bar{F} = xye^{2z}\,\hat{i} + xy^2\cos z\,\hat{j} + x^2\cos xy\,\hat{k}$, find div $\bar{F}$ and curl $\bar{F}$. **5**

2. (a) Using Laplace transform, solve :– **6**
$(D^2 + 3D + 2)y = e^{-2t}\sin t$ where $y(0) = 0$, $y'(0) = 0$.

(b) Find the directional derivative of $d = x^2 y\cos z$ at $(1, 2, \Pi/2)$ in the direction of **6**
$\bar{f} = 2\hat{i} + 3\hat{j} + 2\hat{k}$

(c) Find the fouries series expansion for $F(x) = \sqrt{1 - \cos x}$ in $(0, 2\Pi)$, Hence deduce **8**
that $\frac{1}{2} = \sum \frac{1}{4^{n2} - 1}$.

3. (a) Prove the $J_{3/2}(x) = \sqrt{\frac{2}{\Pi x}}\left\{\frac{\sin x}{x} - \cos x\right\}$. **6**

(b) Evaluate by green's theorem, $\oint_C (x^2 y\,dx + y^3\,dy)$ Where C is the closed path formed **6**
by $y = x$, $y = x^2$.

(c) (i) Find Laplace transform of $\frac{\cos bt - \cos at}{t}$ **4**

TURN OVER

(ii) Find Laplace transform of :– $\frac{d}{dt}\left[\frac{\sin t}{t}\right]$ 4

4. (a) Show that the set of functions $\{\sin x, \sin 3x.....\}$ OR $\{\sin(2n+1)x : n = 0, 1, 2, ...\}$ is orthogonal over $\left[0, \Pi/2\right]$, Hence construct orthonormal set of functions. 6

(b) Find the imaginary part whose real part is $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ 6

(c) Find inverse Laplace transform of :–

(i) $\log\left(\frac{s^2+4}{s^2+9}\right)$ 8

(ii) $\frac{s}{(s^2+4)(s^2+9)}$

5. (a) Obtain half range sine series for $f(x) = x^2$ in $0 < x < 3$. 6

(b) A vector field $\bar{F}$ is given by $\bar{F} = (x^2 - yz)\hat{i} + (y^2 - zx)\hat{j} + (z^2 - xy)\hat{k}$ is irrotational and Hence find scalar point function ϕ such that $\bar{F} = \nabla\phi$ 6

(c) Show that the function $V = e^x$ (xsiny + ycosy) satisfies Laplace equation and find its corresponding analytic function and its harmonic conjugate. 8

6. (a) By using stoke's theorem, evaluate $\oint_C \left[(x^2+y^2)\hat{i} + (x^2-y^2)\hat{j}\right].d\bar{r}$ where 'C' is the boundary of the region enclosed by circles $x^2 + y^2 = 4$, $x^2 + y^2 = 16$. 6

(b) Show that under the transformation $w = \frac{5z-4}{4z-2}$ the circle $|z| = 1$ in the z–plane is transformed into a circle of unity in the w–plane. 6

(c) Prove that $\int J_3(x)\,dx = \frac{-2J_1(x)}{x} - J_2(x)$. 8
