SE Sem III (CBGS) ExTC
Circuits and Transmission Lines

Q.P. Code: 27027

[Time:3 Hours] [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.
4. Use **Smith chart** for the transmission line problem if asked.

Q.1)(a) Find the Norton's equivalent circuit across the terminal a-b for the circuit shown in Figure No.1. (5-M)

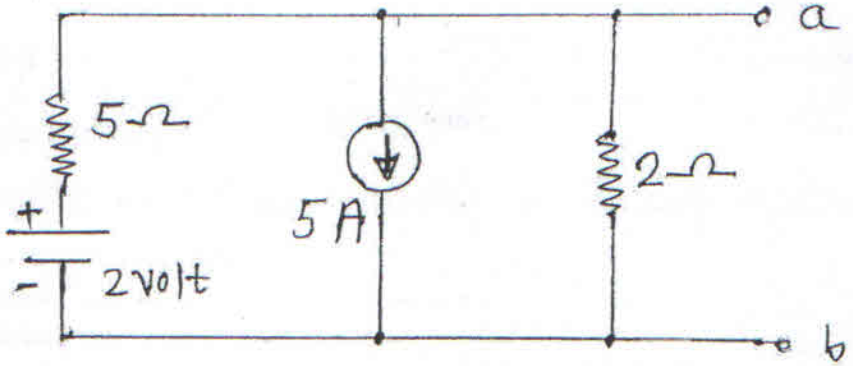

Figure No.1

(b) Obtain the instantaneous value of currents through R and L and obtain the total current in terms of RMS value for the circuit shown in Figure No.2. This circuit is energized by a sinusoidal a.c. voltage of v = 100sin (1000t+36) volt. (5-M).

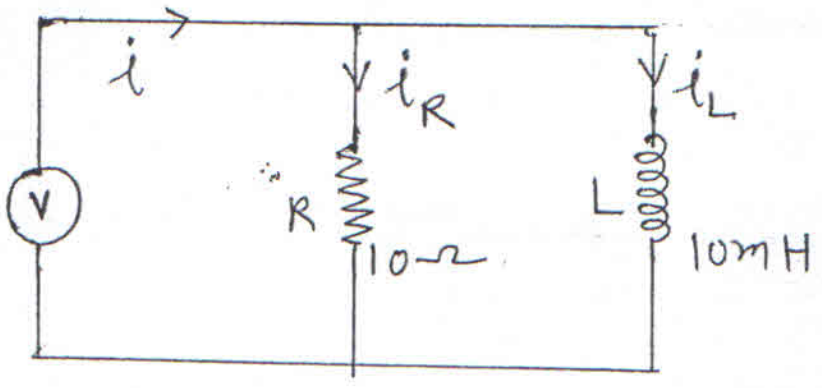

Figure No. 2

(c) Determine the Z- parameters for the circuit shown in Figure No.3. (5-M)

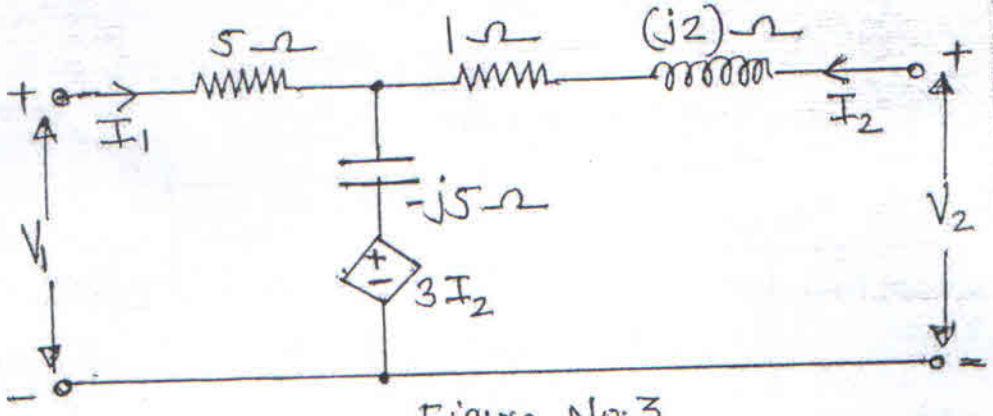

Figure No.3

(d) Differentiate between lossy transmission line and lossless transmission line with respect to (i) Equivalent circuit (ii) Propagation constant (iii) Attenuation constant (iv) Characteristics impedance (v) Input impedance. (5-M)

Q.2) (a) Find the transmission parameters for the circuit shown in Figure No.4 (10-M)

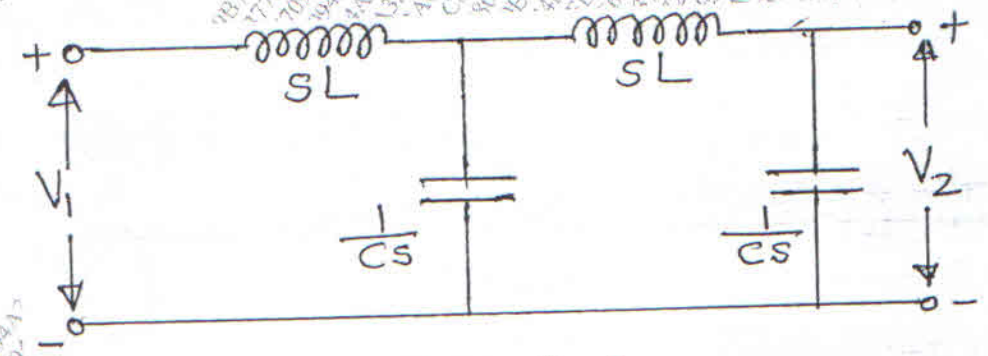

Figure No.4

(b) For network shown in Figure No.5, the switch is opened at t = 0, find v(t) for t > 0. (10-M)

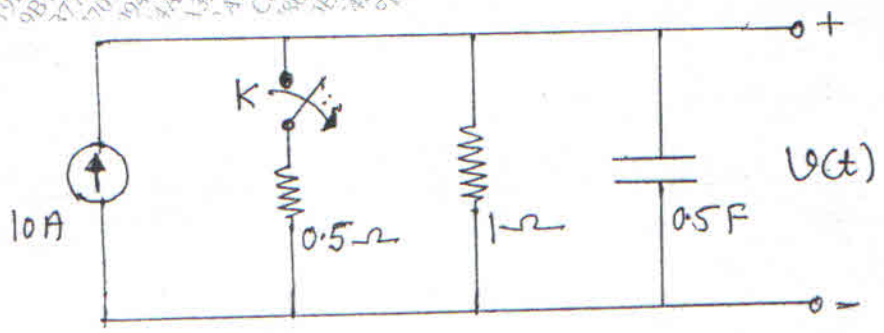

Figure No.5

Q.3) (a) Find the Thevenin's equivalent circuit for the network shown in Figure No.6 at the right of the terminal a-b. (10-M)

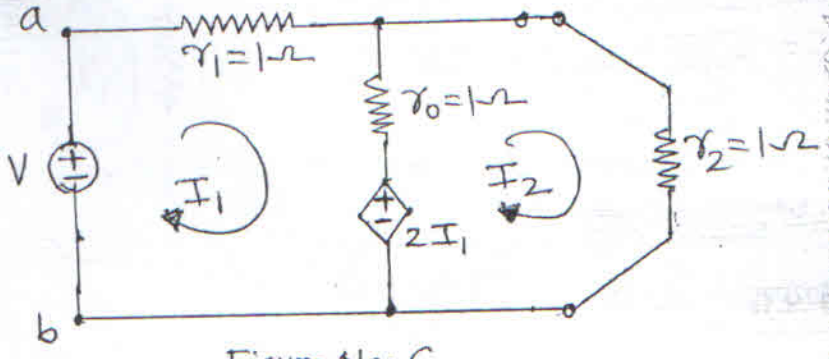

Figure No. 6

(b) A series RC combination, having an impedance of $Z_L = (450\text{-}j600)\ \Omega$ at 100 MHz, is connected to a 300 Ω transmission line. Calculate in meters the position and length of short circuited shunt stub designed to match this load to the line. Give any one solution and solve using **Smith chart** only. (10-M)

Q.4) (a) A driving point impedance is given by $Z_{LC}(s) = \frac{s(s^2+4)(s^2+6)}{(s^2+1)(s^2+5)}$. Obtain the first form of Cauer network. (10-M)

(b) Find the voltage drop across the capacitor and the resistor for the circuit shown in Figure No.7. (10-M)

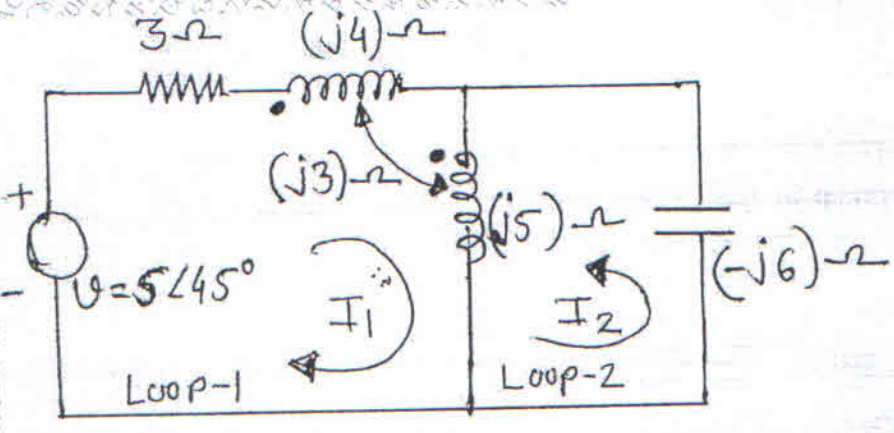

Figure No. 7

Q.5) (a) Find the Z parameters for the network shown in Figure No.8 (10-M)

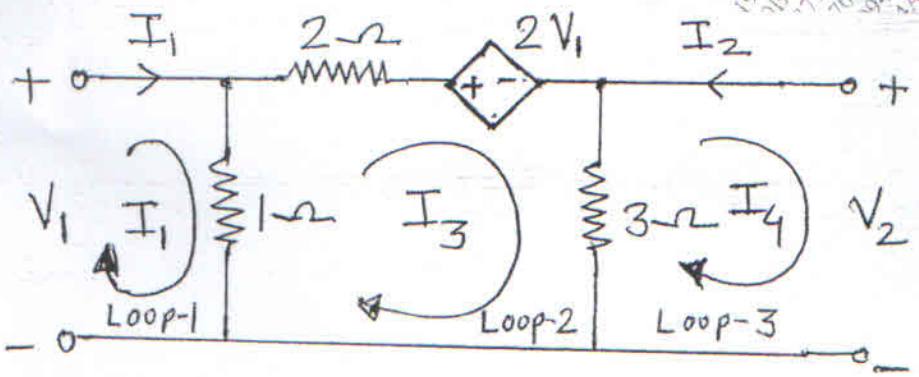

Figure No.8

(b) (I) State properties of the positive real function (PRF). (5-M)

(II) Check positive realness of the function $Y(s) = \frac{S^2+2S+20}{S+10}$ with proper reason. (5-M)

Q.6) (a) Find $V_C(t)$ and $I_L(t)$ in the circuit shown in Figure No.9 assuming zero initial conditions. (10-M)

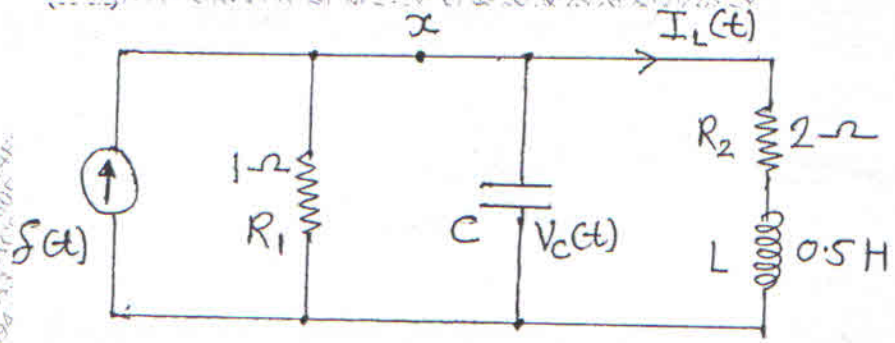

Figure No.9

(b) A load impedance of $Z_L = (40+j70)\ \Omega$ terminates 100 Ω transmission line of length 0.3λ long. Use formulas and determine following parameters. (10-M)

(i) Find load admittance at the load end of transmission line. (2-M)
(ii) Find input impedance at the input port of transmission line. (4-M)
(iii) Find reflection coefficient at the load end of transmission line. (2-M)
(iv) Find voltage wave standing ratio (VSWR) along the transmission line. (2-M)

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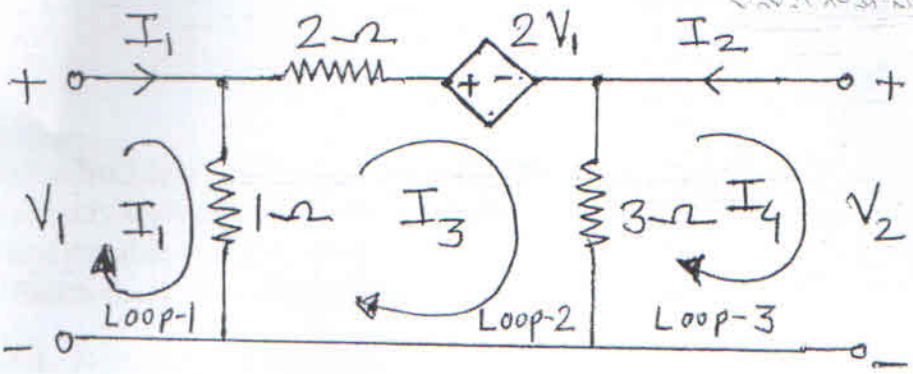

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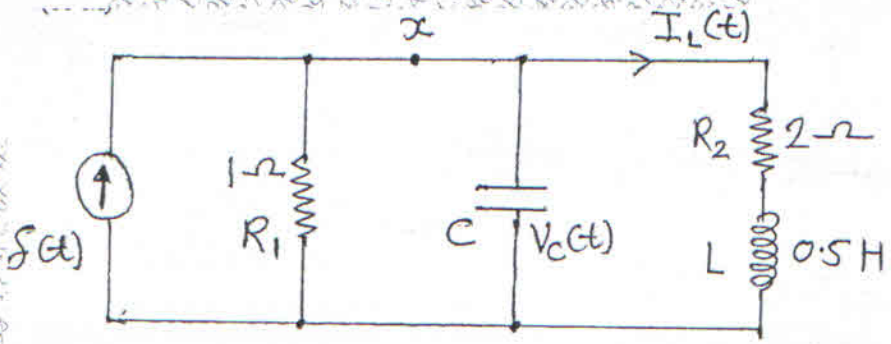

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Q. P. Code : 20753

SE. sem-III - EXTC 7/12/17 (CBSGS) (63)

Digital Electronics.

Time : 3 Hours

Total Marks: 80

N.B. 1. Question No. 1 is **Compulsory**
2. Out of remaining questions, attempt **any three**
3. **Assume** suitable data if required
4. Figures to the right indicate **full marks**

1. (a) Compare SRAM and DRAM [5]
(b) Compare Mealy and Moore machine [5]
(c) Compare TTL and CMOS Logic [5]
(d) Compare PLA with PAL [5]

2. (a) Prove that NAND and NOR Gates are universal Gates [10]
(b) Design a full subtractor and implement using logic Gates [10]

3. (a) Design a 4 bit Binary to Grey code converter [10]
(b) Implement the given function using 8:1 Multiplexer [10]
$F(A, B, C, D) = \sum m(0, 1, 2, 4, 5, 6, 7, 8, 9, 10, 12, 13)$

4. (a) Explain 4-bit asynchronous up counter with proper timing diagram [10]
(b) Write a VHDL program to design a 4:1 Mux [10]

5. (a) Minimize the following expression using Quine McClusky Technique [10]
$F(A,B,C,D) = \sum m(0, 1, 2, 3, 5, 7, 9, 11,15)$
(b) Convert JK FF to T FF and SR FF to D FF [10]

6. (a) Design synchronous mod 5 counter using T FF [10]
(b) Write a note on CPLDs [10]

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Sem-III - CBSGS. EXTC, Analog Electronics-I

Q. P. Code: 24888

Duration: 3hours **Maximum Marks: 80**

N.B.: (1) Question **No. 1 is compulsory**.

(2) Solve any **three** questions from the **remaining five**.

(3) Figures to the right indicate full marks.

(4) Assume suitable data if necessary and mention the same in answer sheet.

Q.1 Attempt any 5 questions [20]

a) Write down current equation of diode and explain significance of each parameter.

b) Calculate I_B, I_C and V_{CE} for the common emitter circuit shown in Fig. 1b

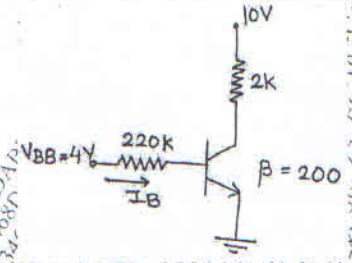

Fig. 1b

c) Explain effect of temperature on JFET and derive equation for zero temperature drift.

d) Compare CE, CB and CC configuration.

e) Draw small signal hybrid pi model of BJT including early effect.

f) Why LC oscillators are preferred for high frequency applications?

Q.2 a) Draw the output waveform for the clipper and clamper circuit shown in Fig 2a and 2b. [10]

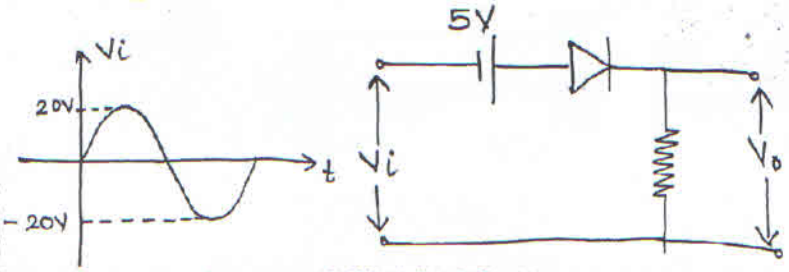

Fig. 2a

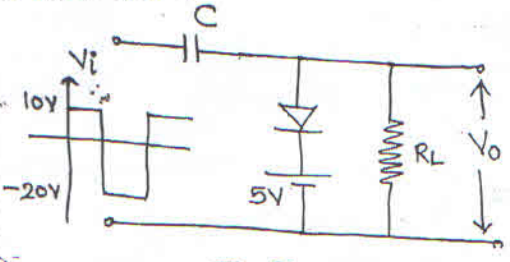

Fig. 2b

b) Derive the expression for frequency of oscillation for a transistorized (BJT) RC phase shift oscillator. [10]

Q.3 a) Find I_{CQ} and V_{CEQ} for the circuit shown in Fig 3a if $\beta = 100$. [10]

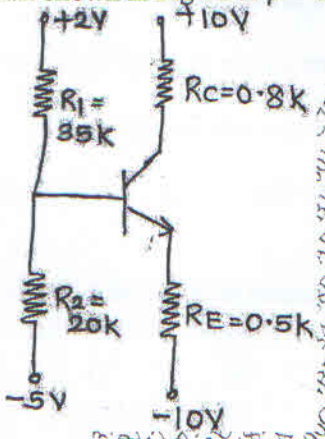

Fig. 3a

b) Explain the construction and characteristics of N-channel Enhancement MOSFET. Draw transfer and drain characteristics. [10]

Q.4 a) For the circuit shown in Fig. 4a, determine V_{GSQ} and V_{DSQ}. Also calculate voltage gain, input impedance and output impedance. [10]
$V_{TN} = 1V$, $K_N = 0.5\ mA/V^2$, $\lambda = 0.01V^{-1}$

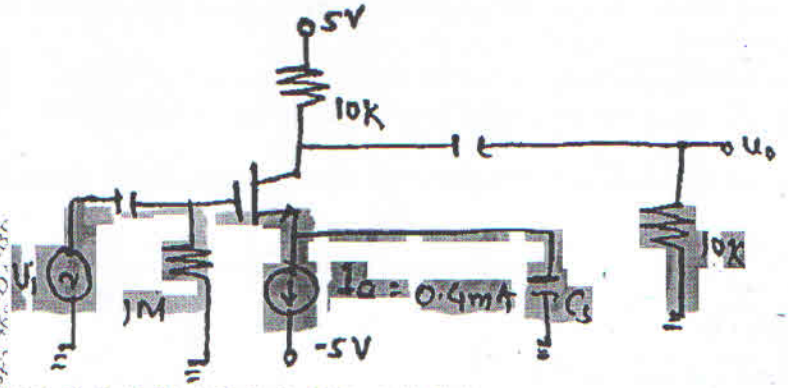

Fig.4a

b) Find I_{DQ}, V_{GSQ}, V_{DSQ}, V_D and V_S for the circuit shown in Fig 4b. [10]

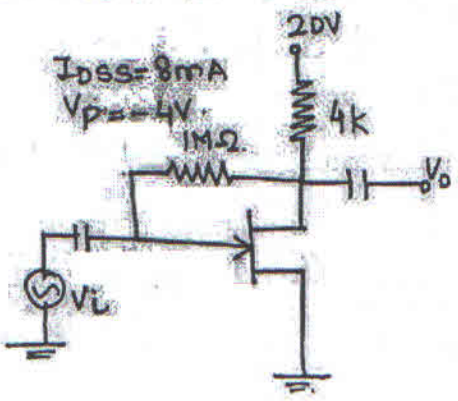

Fig. 4b

Q.5 a) For the circuit shown below in Fig.5b, the transistor parameters are $V_{BE(on)} = 0.7$ V, [10]
$\beta = 100$ and $V_A = \infty$. Determine Z_i, Z_o and A_V

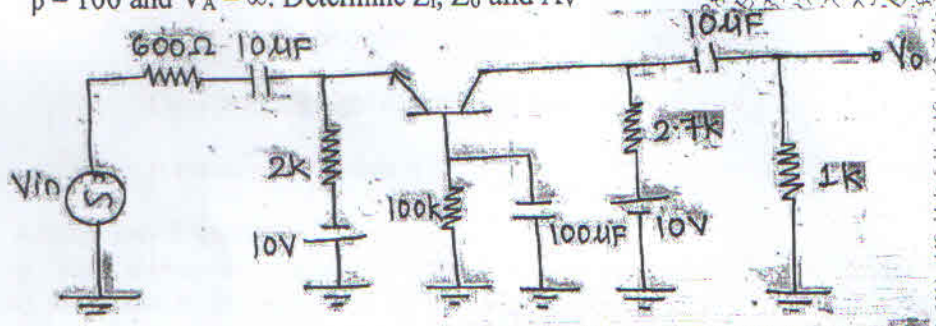

Fig. 5a

b) Draw and explain energy band diagram of MOS capacitor in accumulation, depletion and inversion region. [10]

Q.6 Short notes on: (Attempt any four) [20]

a) Construction and operation of varactor diode
b) Crystal oscillator
c) Transistor as a switch
d) Emitter follower
e) Regions of operation of FET

B.E. Sem-III - CBSGS ETRX & EXTC

Applied Mathematics - III 29/11/17

Q.P. Code : 13606 (12)

(3 Hours) [Total marks : 80

Note :-
1) Question number **1** is **compulsory.**
2) Attempt any **three** questions from the remaining **five** questions.
3) **Figures** to the **right** indicate **full** marks.

Q.1 a) Find the angle between the surfaces $x \log z + 1 - y^2 = 0, \quad x^2y + z = 2$ at $(1, 1, 1)$. 05

b) Show that the functions $f_1(x) = 1$, $f_2(x) = x$ are orthogonal on $(-1, 1)$. Determine the constants a and b such that the function $f_3(x) = -1 + ax + bx^2$ is orthogonal to both f_1 and f_2 on that interval. 05

c) Find the Laplace transform of $\int_0^t u^{-1} e^{-u} \sin u \, du$. 05

d) Prove that $f(z) = (x^3 - 3xy^2 + 2xy) + i(3x^2y - x^2 + y^2 - y^3)$ is analytic and find $f'(z)$ and $f(z)$ in terms of z. 05

Q.2 a) Obtain half- range sine series of $f(x) = x(\pi - x)$ in $(0, \pi)$ and hence, find the value of $\sum \frac{(-1)^n}{(2n-1)^3}$. 06

b) Prove that 06
$\bar{F} = (y^2 \cos x + z^3)\, i + (2y \sin x - 4)\, j + (3xz^2 + 2)\, k$
is a conservative field. Find the scalar potential for $\bar{F}$.

c) Find the inverse Laplace transform of 08

(i) $\frac{s+2}{s^2 - 4s + 13}$

(ii) $\frac{1}{(s-a)(s-b)}$

Q.3 a) Prove that $J_{5/2}(x) = \sqrt{\frac{2}{\pi x}} \left(\frac{3 - x^2}{x^2} \sin x - \frac{3}{x} \cos x \right)$. 06

b) Find the analytic function $f(z) = u + iv$ if 06
$3u + 2v = y^2 - x^2 + 16xy$.

TURN OVER

c) Expand $f(x) = \begin{cases} \pi x, & 0 < x < 1 \\ 0, & 1 < x < 2 \end{cases}$ period 2 into a Fourier Series. 08

Q. 4 a) Prove that
$\int x^3 \cdot J_0(x)\,dx = x^3 \cdot J_1(x) - 2x^2 \cdot J_2(x)$ 06

b) Use Stoke's Theorem to evaluate $\int_C \bar{F} \cdot d\bar{r}$ 06
where $\bar{F} = yz\,i + zx\,j + xy\,k$
and C is the boundary of the circle $x^2 + y^2 + z^2 = 1,\ z = 0$.

c) Solve using Laplace transform $(D^2 - 3D + 2)y = 4e^{2t}$ with 08
$y(0) = -3$ and $y'(0) = 5$.

Q. 5 a) Prove that $2J_0''(x) = J_2(x) - J_0(x)$. 06

b) Use Laplace transform to evaluate 06
$\int_0^\infty e^{-t}\left(\int_0^t u^2 \sin hu \cos hu\,du\right)dt$.

c) Obtain complex form of Fourier Series for $f(x) = e^{\alpha x}$ in $(-\pi, \pi)$ 08
where α is not an integer. Hence deduce that when α is a constant other than an integer

$$\cos \alpha x = \frac{\sin \pi\alpha}{\pi} \sum \frac{(-1)^n \alpha}{(\alpha^2 - n^2)} e^{inx}$$

Q. 6 a) Express the function 06

$$f(x) = \begin{cases} -e^{kx} & for\ x < 0 \\ e^{-kx} & for\ x > 0 \end{cases}$$

as Fourier Integral and hence, prove that

$$\int_0^\infty \frac{\omega \sin \omega x}{\omega^2 + k^2}\,d\omega = \frac{\pi}{2} e^{-kx} \quad if \quad x > 0, k > 0.$$

b) Using Green's theorem evaluate 06

$$\oint_C (e^{x^2} - xy)\,dx - (y^2 - ax)\,dy$$

where C is the circle $x^2 + y^2 = a^2$.

c) Under the transformation $w = \frac{z-1}{z+1}$, show that the map of the straight line $y = x$ is a circle and find its center and radius. 08

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