USN ☐☐☐☐☐☐☐☐☐☐ **18MAT31**

Third Semester B.E. Degree Examination, July/August 2021
Transform Calculus, Fourier Series and Numerical Techniques

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions.*

1 a. Find $L[t\,e^{-2t}\sin 4t]$. **(06 Marks)**

   b. A periodic function of period $2\pi/\omega$ is defined by $f(t) = \begin{cases} E\sin\omega t, & 0 \le t < \pi/\omega \\ 0, & \pi/\omega \le t < 2\pi/\omega \end{cases}$. Where E and ω are constants. **(07 Marks)**

   c. Solve : $y''(t) + k^2 y(t) = 0;\;\; y(0) = 0$ and $y'(0) = 1$ by Laplace transformation. **(07 Marks)**

2 a. Find : i) $L^{-1}\left\{\dfrac{s^2 - 3s + 4}{s^3}\right\}$ ii) $L^{-1}\left[\mathrm{Cot}^{-1}\left(\dfrac{S}{2}\right)\right]$. **(06 Marks)**

   b. Find the inverse Laplace transform of $\dfrac{1}{(s-1)(s^2+1)}$ by using convolution theorem. **(07 Marks)**

   c. Express the following function in terms of Heaviside step function and hence find its Laplace transform where $f(t) = \begin{cases} t^2, & 0 < t \le 2 \\ 4t, & t > 2 \end{cases}$. **(07 Marks)**

3 a. Expand $f(x) = x(2\pi - x)$ as a Fourier series in $[0, 2\pi]$. **(06 Marks)**

   b. Obtain Fourier series for the function $f(x)$ given by $f(x) = \begin{cases} 1 + \dfrac{2x}{\pi}, & -\pi \le x \le 0 \\ 1 - \dfrac{2x}{\pi}, & 0 \le x \le \pi \end{cases}$. **(07 Marks)**

   c. Find the half range sine series of $f(x) = \dfrac{e^{ax}}{\sinh a\pi}$ in $(0, \pi)$. **(07 Marks)**

4 a. Find the Fourier series expansion of $f(x)$ given by $f(x) = \begin{cases} 1 & 0 < x < 1 \\ 2 & 1 < x < 3 \end{cases}$. **(06 Marks)**

   b. Find the half range sine series for x^2 in $(0, \pi)$. **(07 Marks)**

   c. The values of x and the corresponding values of $f(x)$ over a period T are given below. Show that $f(x) = 0.75 + 0.37\cos\theta + 1.004\sin\theta$ where $\theta = \dfrac{2\pi x}{T}$. **(07 Marks)**

x	0	T/6	T/3	T/2	2T/3	5T/6	T
f(x)	1.98	1.30	1.05	1.30	−0.88	−0.25	1.98

5 a. State: i) Initial and final value theorems ii) Find the Z–transform of $\cos\left(\dfrac{n\pi}{2} + \dfrac{\pi}{4}\right)$. **(06 Marks)**

   b. Find the complex Fourier transform of the function $f(x) = \begin{cases} 1 & \text{for } |x| \le a \\ 0 & \text{for } |x| > a \end{cases}$. Hence evaluate $\displaystyle\int_0^\infty \left(\dfrac{\sin x}{x}\right) dx$. **(07 Marks)**

   c. Compute the inverse Z-transform of $\dfrac{3z^2 + 2z}{(5z - 1)(5z + 2)}$. **(07 Marks)**

6 a. Find the Fourier cosine transform of $f(x) = \begin{cases} x, & 0 < x < 2 \\ 0, & \text{else where} \end{cases}$. **(06 Marks)**

b. Find the Z-transform of $2n + \sin\dfrac{n\pi}{4} + 1$. **(07 Marks)**

c. Solve the difference equation : $u_{n+2} - 3u_{n+1} + 2u_n = 0$, with $u_0 = 0$ and $u_1 = -1$. **(07 Marks)**

7 a. Find by Taylor's series method the value of y at x = 0.1 to five places of decimals from $\dfrac{dy}{dx} = x^2 y - 1, y(0) = 1$. **(06 Marks)**

b. Use fourth order Runge-Kutta method to solve $(x + y)\dfrac{dy}{dx} = 1, y(0.4) = 1$ at x = 0.5 correct to four decimal places. **(07 Marks)**

c. If $\dfrac{dy}{dx} = 2e^x - y$, y(0) = 2, y(0.1) = 2.010, y(0.2) = 2.040 and y(0.3) = 2.090, find y(0.4) correct to four decimal places by using Milne's predictor – corrector method and applying corrector formula twice. **(07 Marks)**

8 a. Using modified Euler's formula compute y(1.1) correct to five decimal places given that $\dfrac{dy}{dx} + \dfrac{y}{x} = \dfrac{1}{x^2}$ and y = 1 at x = 1. [taking h = 0.1]. **(06 Marks)**

b. Employ Taylor's series method to find y at x = 0.1 and 0.2 correct to four places of decimal. Given $\dfrac{dy}{dx} - 2y = 3e^x$, y(0) = 0. **(07 Marks)**

c. Solve the differential equation $y' + y + xy^2 = 0$ with the initial values of y : $y_0 = 1$, $y_1 = 0.9008$, $y_2 = 0.8066$, $y_3 = 0.722$ corresponding to the values of x : $x_0 = 0$, $x_1 = 0.1$, $x_2 = 0.2$, $x_3 = 0.3$ by computing the value of y corresponding to x = 0.4 applying Adams – Bashforth predictor and corrector formula. **(07 Marks)**

9 a. Given $y'' - xy' - y = 0$ with the initial conditions y(0) = 1, y'(0) = 0, compute y(0.2) using fourth order Runge-Kutta method. **(06 Marks)**

b. Derive Euler's equation in the standard form $\dfrac{\partial f}{\partial y} - \dfrac{d}{dx}\left(\dfrac{\partial f}{\partial y'}\right) = 0$. **(07 Marks)**

c. A heavy cable hangs freely under gravity between two fixed points. Show that the shape of the cable is a catenary. **(07 Marks)**

10 a. Apply Milne's method to compute y(0.8) given that $y'' = 1 - 2yy'$ and the following table of initial values. **(07 Marks)**

x	0	0.2	0.4	0.6
y	0	0.02	0.0795	0.1762
y'	0	0.1996	0.3937	0.5689

b. Prove that the geodesics on a plane are straight line. **(06 Marks)**

c. Find the extremal of the functional : $\displaystyle\int_{x_0}^{x_1}(y^2 + y'^2 - 2y\sin x)dx$. **(07 Marks)**

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Third Semester B.E. Degree Examination, July/August 2021
Network Theory

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions.

1 a. Find the equivalent resistance Rab for circuit in Fig. Q1 (a) and use it to find i.   **(06 Marks)**
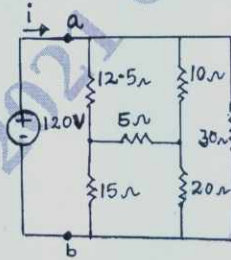

Fig. Q1 (a)

b. Determine power supplied by the dependent source of Fig. Q1 (b), using nodal analysis.
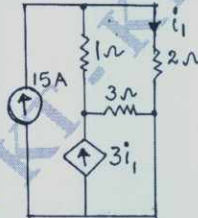
(06 Marks)

Fig. Q1 (b)

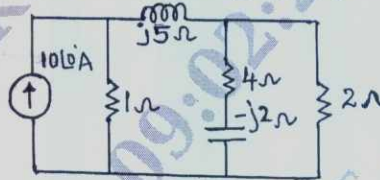c. Determine current through 2 Ω resistor of Fig. Q1 (c) using mesh analysis.   **(08 Marks)**

Fig. Q1 (c)

2 a. Using source transformation and source shifting techniques, find voltage across 2 Ω resistor in Fig. Q2 (a).   **(06 Marks)**
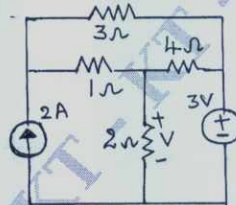

Fig. Q2 (a)

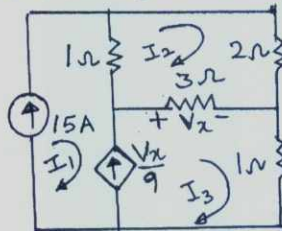b. Find I_1, I_2, I_3 in the circuit of Fig. Q2 (b) using mesh analysis.   **(06 Marks)**

Fig. Q2 (b)
1 of 5

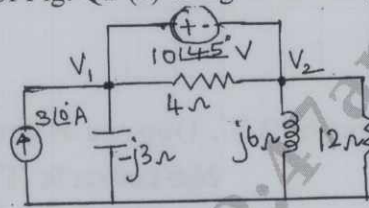c. Compute V_1, V_2 in the circuit of Fig. Q2 (c) using nodal analysis. (08 Marks)

Fig. Q2 (c)

3 a. For the circuit in Fig. Q3 (a), use the superposition theorem to find I. (06 Marks)
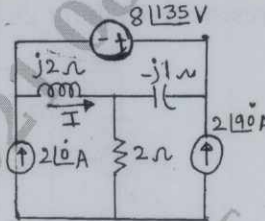

Fig. Q3 (a)

b. Using Norton's theorem, find current through 5 Ω resistor in Fig. Q3 (b). (06 Marks)
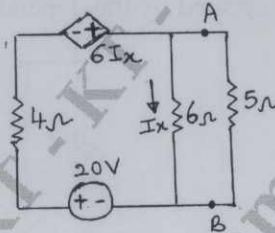

Fig. Q3 (b)

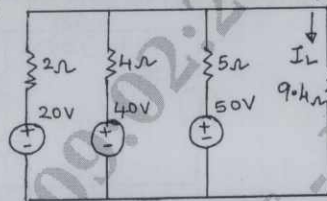c. State Millman's theorem, using Millman's theorem find I_L in Fig. Q3 (c). (08 Marks)

Fig. Q3 (c)

4 a. Determine the Thevenin equivalent at terminals A-B of the circuit in Fig. Q4 (a). (06 Marks)
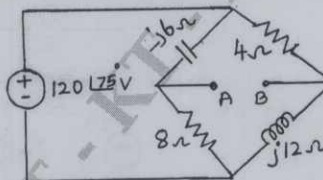

Fig. Q4 (a)

b. Compute the value of R that results in maximum power transfer to it in Fig. Q4 (b). Find the maximum power. (06 Marks)
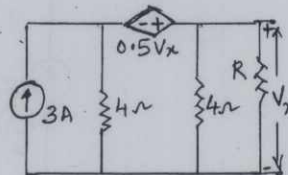

Fig. Q4 (b)

c. State Reciprocity theorem. Find V_x and verify Reciprocity theorem for circuit in Fig. Q4 (c).

(08 Marks)
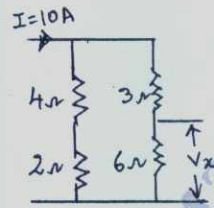
Fig. Q4 (c)

5 a. In the network shown in Fig. Q5 (a), the switch K is opened at t = 0. Solve for the values of V, $\dfrac{dV}{dt}$ and $\dfrac{d^2V}{dt^2}$ at t = 0⁺.

(10 Marks)
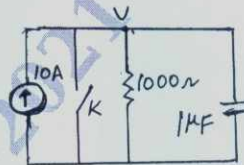
Fig. Q5 (a)

b. In the network shown in Fig. Q5 (b), a steady state is reached with the switch K open. At t = 0 switch K is closed. Solve for the values of I_1, I_2, V_C, $\dfrac{dI_1}{dt}$, $\dfrac{dI_2}{dt}$ at t = 0⁺.

(10 Marks)
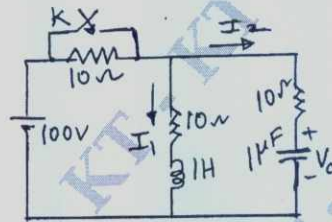
Fig. Q5 (b)

6 a. In the network shown in Fig.6(a), K is changed from position a to b at t = 0. Solve for i, $\dfrac{di}{dt}$, $\dfrac{d^2i}{dt^2}$ at t = 0⁺, The steady state having reached before switching.

(10 Marks)
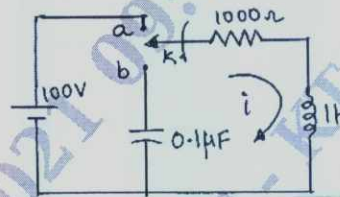
Fig. Q6 (a)

b. In the network of Fig. Q6(b), the switch K is closed at t = 0 with zero capacitor voltage and zero inductor current. Solve for (a) V_1 and V_2 at t = 0⁺ (b) V_1 and V_2 at t = ∞, (c) $\dfrac{dV_1}{dt}$ and $\dfrac{dV_2}{dt}$ at t = 0⁺, (d) $\dfrac{d^2V_2}{dt^2}$ at t = 0⁺.

(10 Marks)
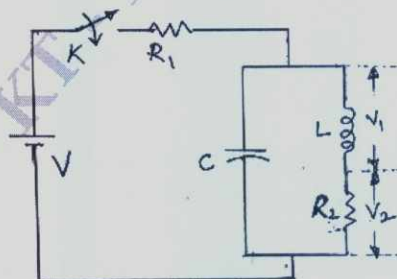
Fig. Q6 (b)

7 a. In the circuit given in the Fig. Q7 (a) switch is closed on position 1 at t = 0 and at t = 500 μs, switch is moved to position 2. Obtain the equation of current in both intervals. Use Laplace transforms. **(10 Marks)**
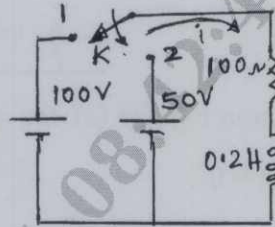
Fig. Q7 (a)

b. Determine the Laplace transform of the periodic sawtooth waveform, as shown in Fig. Q7 (b). **(10 Marks)**
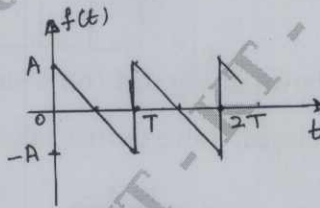
Fig. Q7 (b)

8 a. A voltage pulse, of unit height and width T is applied to the circuit in the Fig. Q8 (a) at t = 0. Determine the voltage across the capacitance C as a function of time. **(10 Marks)**
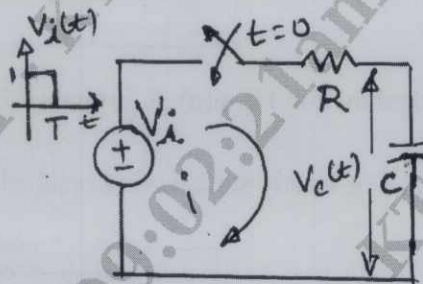
Fig. Q8 (a)

b. Determine the Laplace transform of waveform given in Fig. Q8 (b). **(10 Marks)**
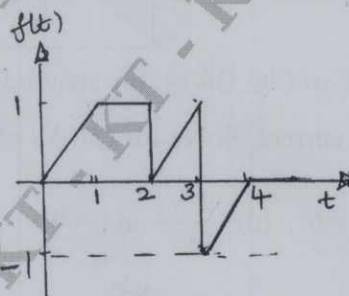
Fig. Q8 (b)

9 a. With respect to series resonant circuit, show that resonant frequency is equal to the geometric mean of two half power frequencies. **(08 Marks)**

b. A series resonant circuit includes 1 μF capacitor, resistance of 16 Ω and an inductance of L henry. If the bandwidth is 500 rad/sec, determine (i) ω_r (ii) Q   (iii) L. **(06 Marks)**

c. Find the value of L for which the circuit resonates at a frequency of 1000 rad/sec for the circuit in the Fig. Q9 (c). **(06 Marks)**
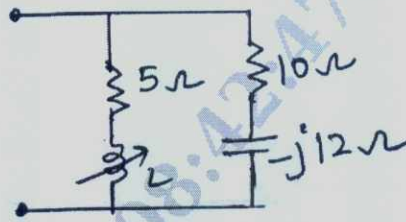
Fig. Q9 (c)

10 a. Derive Z-parameters in terms of hybrid parameters. **(08 Marks)**
   b. Determine the Z-parameters of the network shown in Fig. Q10 (b). **(06 Marks)**
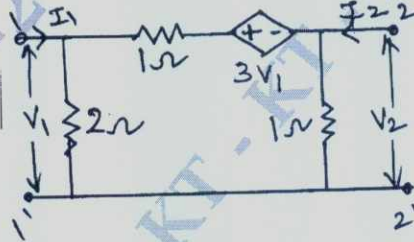
Fig. Q10 (b)

c. For the network shown in Fig. Q10 (c), find the Y parameters. **(06 Marks)**
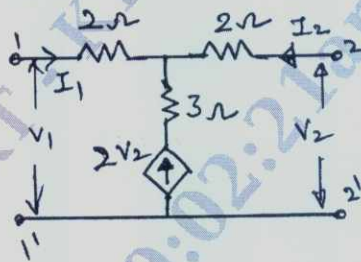
Fig. Q10 (c)

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18EC33

Third Semester B.E. Degree Examination, July/August 2021
Electronic Devices

Time: 3 hrs.

Max. Marks: 100

Note: *Answer any FIVE full questions.*

1   a. What are the different types of Bonding Forces in solids and explain any one. **(06 Marks)**
    b. Draw the typical band structures at OK for insulator, semiconductor and metal and explain it. **(06 Marks)**
    c. With mathematical equations, describe the hall effect. **(08 Marks)**

2   a. Explain Electron-hole pair in a semiconductor with the help of the graph. **(06 Marks)**
    b. Explain the effects of temperature and doping on mobility. **(06 Marks)**
    c. Describe the drift of electrons and holes in a semiconductor bar. **(08 Marks)**

3   a. Draw the I-V characteristic of a Pn-junction with current equation under equilibrium, forward and reverse bias and explain it. **(06 Marks)**
    b. Explain the concept of Zener breakdown with energy band diagram. **(06 Marks)**
    c. Explain the solar cells with structures. **(08 Marks)**

4   a. Draw the piece wise linear approximations of junction diode characteristics for ideal diode, ideal diode with offset voltage and ideal diode with offset voltage and resistance. **(06 Marks)**
    b. Draw the schematic representation of a P-i-n photodiode and explain it. **(06 Marks)**
   c. Explain the Avalanche Breakdown with energy diagram. **(08 Marks)**

5   a. Explain the working of P-n-P device and also draw the curve of I_C versus V_{BC}. **(06 Marks)**
    b. Describe the various mechanisms of a switching cycle of a PnP transistor. **(06 Marks)**
    c. Write the step-by-step fabrication of a BJT with diagrams. **(08 Marks)**

6   a. Define the following parameters:
       i)   Emitter injection efficiency
       ii)   Current transfer ratio
       iii) Base to collector current amplification factor. **(06 Marks)**
    b. Draw the simple switching circuit of PnP transistor and explain it. **(06 Marks)**
    c. Discuss Base Narrowing in PnP transistor. **(08 Marks)**

7   a. Explain the operation of a basic Pn JFET for different gate voltage. **(10 Marks)**
    b. Draw the small signal equivalent circuit of JFET and explain it. **(10 Marks)**

8   a. Draw the energy band diagram of an two terminal MOS capacitor with a P-type substrate for a negative gate bias and a moderate positive gate bias and explain it. **(10 Marks)**
    b. Explain the structure of n-channel enhancement mode and depletion mode MOSFET. **(10 Marks)**

9   a. Describe the Rapid thermal processing with the help of diagram. **(10 Marks)**
    b. Explain the method of ION implementation with schematic diagram. **(10 Marks)**

10 a. What are the types of integrated circuits and explain it. **(06 Marks)**
    b. Mention the Advantages of Integration. **(06 Marks)**
    c. With input and output waveforms, explain the working of CMOS inverter. **(08 Marks)**

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Third Semester B.E. Degree Examination, July/August 2021
Digital System Design

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions.*

1   a.   Define combinational logic circuit and place the following equation into the proper canonical form:
        $P = f(a, b, c) = ab' + ac' + bc$ **(04 Marks)**

    b.   Obtain minimal expression using k-map for the following incompletely specified function:
        $F(a, b, c, d) = \sum m(0, 1, 4, 6, 7, 9, 15) + \sum d(3, 5, 11, 13)$ and draw the circuit diagram using basic gates.   **(06 Marks)**

    c.   Minimize the expression using Quine Mecluskey method.
        $Y = \overline{A}B\overline{C}\overline{D} + \overline{A}BC\overline{D} + AB\overline{C}D + AB\overline{C}\overline{D} + A\overline{B}\overline{C}\overline{D} + \overline{A}\,\overline{B}\,C\overline{D}$ **(10 Marks)**

2   a.   Place the following equations into the proper canonical form:
        i) $G = f(w, x, y, z) = \overline{w}x + y\overline{z}$
        ii) $T = f(a, b, c) = (a + \overline{b})(\overline{b} + c)$ **(04 Marks)**

    b.   Obtain minimal logical expression for the given maxterm expression using K-map
        $f(a, b, c, d) = \pi M (0, 1, 4, 5, 6, 7, 9, 14) \cdot \pi d(13, 15)$ **(06 Marks)**

    c.   Obtain all the prime implicants of the following Boolean function using Quine-Meckluskey method
        $f(a, b, c, d) = \sum(0, 2, 3, 5, 8, 10, 11)$. Verify the result using K map technique.   **(10 Marks)**

3   a.   Draw the circuit for 3 to 8 decoder and explain.   **(08 Marks)**

    b.   Implement the following Boolean function using 4:1 multiplexer.
        $F[A, B, C, D] = \sum m (0, 1, 2, 4, 6, 9, 12, 14)$.   **(06 Marks)**

    c.   A combinational circuit is defined by the functions $F_1 = \sum m (3, 5, 7)$, $F_2 = \sum m (4, 5, 7)$. Implement the circuit with a programmable logic array having 3 inputs, 3 product terms and two outputs.   **(06 Marks)**

4   a.   Draw the key pad interfacing diagram to a digital system using 10-line decimal to BCD encoder and explain.   **(06 Marks)**

    b.   Explain Look-Ahead carry adder with neat diagram and relevant expression.   **(06 Marks)**

    c.   Design 2-bit comparator using gates.   **(08 Marks)**

5   a.   Explain the operation of a switch debouncer using S-R. Latch with the help of circuit and waveforms.   **(06 Marks)**

    b.   Find characteristic equations for S-R and T. Flip flops with the help of function tables and explain.   **(06 Marks)**

    c.   Explain the working principle of 4-bit synchronous binary counts.   **(08 Marks)**

6 a. Draw the logic diagram, functional table and timing diagram of master-slave JK flip flop and explain briefly. (10 Marks)

b. Explain four bit binary ripple counter with logic and timing diagram. (10 Marks)

7 a. Design mod-6 synchronous counter by using JK flip-flop, with excitation table. (10 Marks)

b. Draw and explain Mealy and Moore sequential circuit model and compare mealy and Moore circuit models. (10 Marks)

8 a. Design a Mod-6 synchronous counter using clocked T Flip-Flop. (10 Marks)

b. Construct the transition table, state table and state diagram for the sequential circuit shown in Fig.Q.8(b). (10 Marks)
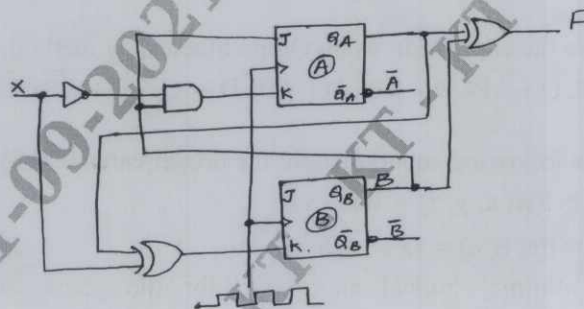
Fig.Q.8(b)

9 a. Design and draw Mealy model of sequential detector circuit to detect the pattern 101. (10 Marks)

b. Draw the block diagram of serial adder with accumulator and explain its working operation. (10 Marks)

10 a. State the guidelines for construction of state graph. (06 Marks)

b. Draw the block diagram of binary multiplier and explain its working principle. (08 Marks)

c. Draw and explain the operation of FPGA implementation of a parallel adder with accumulator. (06 Marks)

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Third Semester B.E. Degree Examination, July/August 2021
Computer Organization and Architecture

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions.

1   a. Explain following registers: (i) PC   (ii) IR   (iii) MAR   **(06 Marks)**
    b. Explain how user program and OS routine are sharing processor with printer.   **(08 Marks)**
    c. Explain basic performance equation.   **(06 Marks)**

2   a. Perform using 2's complement arithmetic: (i) $-5 + (-2)$ (ii) Subtract -5 from -7 **(06 Marks)**
    b. Explain BIG-ENDIAN and LITTLE-ENDIAN assignment.   **(06 Marks)**
    c. Illustrate instruction execution and straight line sequencing for the program $C \leftarrow [A] + [B]$. [Assume that each instruction is 4 byte].   **(08 Marks)**

3   a. List the generic addressing modes with assembler syntax and addressing function.   **(10 Marks)**
    b. Explain shift and any two rotate instructions with relevant diagrams.   **(10 Marks)**

4   a. Write assembly language program to add 'N' numbers and store the result in 'SUM'. Assume the following address:
       (i)   Program should start from '100'.
       (ii)   'N' is stored at 204
       (iii) Numbers are stored in memory from the address 208. Each number is 4 bytes.
       (iv)   'SUM' is stored at 200
       (v)   Assume each instruction is 4 byte   **(08 Marks)**
    b. Explain stack concept with relevant diagrams.   **(08 Marks)**
    c. List the steps involved in 'CALL' and 'RETURN' instructions.   **(04 Marks)**

5   a. Explain I/O interface for input device and also write the assembly program that reads the one LINE from the keyboard and echoes it back to the display.   **(10 Marks)**
    b. Explain methods used for enabling and disabling interrupts.   **(10 Marks)**

6   a. Explain daisy chain method used for handling simultaneous interrupt request.   **(06 Marks)**
    b. Explain memory mapped I/O access.   **(06 Marks)**
    c. Explain use of DMA controller in computer system.   **(08 Marks)**

7   a. Calculate number of address lines required to access following memory:
       (i) 64 KB   (ii) 512 MB   (iii) 256 KB   (iv) 8 GB   **(04 Marks)**
    b. Explain internal organization of $2M \times 8$ dynamic memory chip.   **(08 Marks)**
    c. Explain different types of nonvolatile memory.   **(08 Marks)**

8   a. Explain cache memory and its relevant terms.   **(08 Marks)**
    b. Explain virtual memory organization.   **(06 Marks)**
    c. Explain magnetic disk principles.   **(06 Marks)**

9   a. Explain single bus organization of the data path inside a processor.   **(10 Marks)**
    b. List the steps involved in memory read operation and also draw corresponding timing diagram.   **(10 Marks)**

10 a. Write the control sequence for execution of the instruction Add (R_3), R_1.   **(06 Marks)**
    b. Explain block diagram of a complete processor.   **(06 Marks)**
    c. Explain micro programmed control concept.   **(08 Marks)**

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18EC36

Third Semester B.E. Degree Examination, July/August 2021
Power Electronics and Instrumentation

Time: 3 hrs.

Max. Marks:100

Note: *Answer any FIVE full questions.*

1 a. Briefly explain power electronic system with neat block diagram. **(04 Marks)**
 b. Mention and explain the different types of power electronic converters and mention their any two applications. **(08 Marks)**
 c. Explain an operation of resistance firing circuit with neat waveforms. **(08 Marks)**

2 a. Explain with a neat circuit diagram VI characteristics of SCR, define the latching current, break over voltage and holding current. **(08 Marks)**
 b. Explain briefly about the gate triggering circuits with waveforms. **(08 Marks)**
 c. Explain with a neat circuit diagram basic operation of uJT. **(04 Marks)**

3 a. Explain with neat waveforms phase angle control and PWM control. **(09 Marks)**
 b. Explain briefly how choppers are classified. **(06 Marks)**
 c. A DC chopper circuit connected to a 100V DC source supplies an inductive load having 40mH in series with a resistance of 5Ω. A freewheeling diode is placed across the load. The load current varies between the limits of 10A and 12A. Determine the time ratio of the chopper. **(05 Marks)**

4 a. Explain the working principle of stepdown chopper with neat circuit diagram and waveforms. And drive the equations for rms voltage and current. **(10 Marks)**
 b. With necessary waveforms explain the operation of a single phase half wave controller with inductive load. Derive the expression for average load voltage. **(10 Marks)**

5 a. How inverters are classified. **(04 Marks)**
 b. With a neat circuit diagram and waveforms explain the operation of single phase half bridge inverter with resistive load. **(08 Marks)**
 c. A basic D'Arsonval movement with an internal resistance of 50Ω and a full scale deflection current of 2mA is to be used as a multi range voltmeter. Determine the series resistance to obtain the voltage ranges of D-10V, 0-50V, 0-100V. **(08 Marks)**

6 a. Briefly explain the discontinuous mode fly back converter. **(10 Marks)**
 b. What are the different types of static characteristics and define each term. **(10 Marks)**

7 a. Draw the block diagram and explain the working principle of dual slope integrating type DVM. **(08 Marks)**
 b. Explain the working principle of digital frequency meter with basic circuit. **(06 Marks)**
 c. Derive an balance bridge equation for wheat stone's bridge. **(06 Marks)**

8 a. With help of staircase waveform and block diagram explain the working of staircase ramp·type voltmeter. **(06 Marks)**
 b. With block diagram, explain the time base selector. **(06 Marks)**
 c. Derive an equation for unbalanced wheat stone's bridge. **(08 Marks)**

9 a. Write a brief note on potentiometer type resistive transducer. **(06 Marks)**
 b. Explain the working of analog weight scale. **(06 Marks)**
 c. With a neat diagrams, explain the PLC structure. **(08 Marks)**

10 a. With a neat sketch, explain construction and working of LVDT. **(10 Marks)**
 b. Write a note on PLC operation and relays. **(10 Marks)**

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Question Paper Version : A

Third/Fourth Semester B.E Degree Examination, July/August 2021
Constitution of India, Professional Ethics and Cyber Law
(COMMON TO ALL BRANCHES)

Time: 2 hrs.]

[Max. Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the hundred questions, each question carries one mark.

2. Use only **Black ball point pen** for writing / darkening the circles.

3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**

4. Darkening two circles for the same question makes the answer invalid.

5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

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1. The Indian Constitution is,
   a) Based on convention
   b) A brief document
   c) An evolved constitution
   d) Written and Lengthy document

2. The Phrase Economic Justice is found in,
   a) Fundamental rights
   b) Preamble and Directive principle of state policy
   c) Fundamental duties and DPSP
   d) Fundamental duties

3. The total number of Articles in the Indian Constitution in 1950 is,
   a) 397
   b) 395
   c) 400
   d) 445

4. The President/Chairman of the constituent assembly was,
   a) Jawaharlal Nehru
   b) M.K. Gandhi
   c) Dr. B. R. Ambedkar
   d) Dr. Babu Rajendra Prasad

5. Our Constitution was adopted on,
   a) 26th Jan 1950
   b) 26th Nov 1949
   c) 15th Aug 1947
   d) 26th Feb 1946

6. Which of the following is not a fundamental right,
   a) Right to Freedom
   b) Right to Property
   c) Right to Constitutional Remedies
   d) Right to Religion

7. In case of illegal detention of a Person the High court or Supreme court issue _____ writ,
   a) Mandamus
   b) Quo-warranto
   c) Habeas corpus
   d) Certiorari

8. The term "Secular" means,
a) Peoples Government
b) No King or Queen
c) Equal opportunity to all
d) Treating all religions equally

9. Which of these article is known as heart and soul of our constitution,
a) Article - 19
b) Article – 14
c) Article - 21
d) Article - 32

10. A Person arrested has to be produced before the Magistrate within,
a) One week
b) 72 hours
c) 48 hours
d) 24 hours

11. The Government of India Act of 1935, Abolished
a) Dyarchy at the centre
b) Dyarchy at the province
c) Provincial Autonomy
d) All the above

12. The Right to Equality is under Article,
a) 12
b) 14
c) 19
d) 21

13. Freedom of Assembly is under Article
a) 14
b) 15
c) 19
d) 21

14. Fundamental Duties were incorporated in the constitutional amendment number,
a) 42nd
b) 44th
c) 45th
d) 46th

15. Under the Indian Constitution subjects of administration are divided into,
a) 2 lists
b) 3 lists
c) 4 lists
d) 5 lists

16. Right to constitutional remedies is provided in the
a) Art-12
b) Art-14
c) Art-19
d) Art-32

17. The Speaker of the Loka Sabha is,
a) Appointed by PM
b) Appointed by the President
c) Selected by the member of Lok Sabha
d) Selected by the member of Parliament

18. Chairman of the constitution drafting committee was,
a) Jagjivan Ram
b) M K Gandhi
c) Jawaharlal Nehru
d) Dr. B. R. Ambedkar

19. The word "Secular" was inserted in the constitution,
a) Preamble
b) Directive principle of state policy
c) Fundamental right
d) Fundamental duties

20. Fundamental duties in the Indian are provided by way of,
a) Amendment
b) Order of supreme court
c) G.O.
d) Order of President

21. The executive power of the state is vested in the,
a) Governor
b) Chief Minister
c) President
d) Chief Secretary

22. _____ Administer oath of office to the governor,
a) PM
b) CM
c) President
d) Chief Justice of the High Court

23. The total number of Ministers including the CM of a state shall not exceed _____ of the total number of MLAs,
a) 12%
b) 15%
c) 20%
d) 40%

24. The minimum age stipulated to become MLC is,
    a) 25   b) 30   c) 35   d) 40

25. The Chief Minister shall be appointed by the,
    a) PM   b) President   c) Chief Justice   d) Governor

26. The Governor of a state is appointed by,
    a) PM   b) CM   c) President   d) Party High Command

27. The term of the state assembly is,
    a) 4 year   b) 5 year   c) 6 year   d) 3 year

28. The Judge of a High Court may be removed by,
    a) PM   b) CM   c) President   d) By a process of impeachment

29. The High Court Jurisdiction under Article 226 is called,
    a) Original Jurisdiction   b) Writ Jurisdiction   c) Appellate   d) Residual

30. Under Article _____ of the constitution parliament has the power to amend the constitution,
    a) Article 256   b) Article 311   c) Article 356   d) Article 368

31. Which of the following is known as the fundamental right case,
    a) Kesavananda Bharati case   b) Minerva Mills case
    c) Maneka Gandhi case   d) Golaknath case

32. _____ Constitutional Amendment reduced the voting age from 21 years to 18 years
    a) 41st b) 61st c) 73rd d) 74th

33. Right to Education (RTE) was introduced in Amendment
    a) 46th b) 61st c) 76th d) 86th

34. _____ Amendment introduced GST,
    a) 99th b) 100th c) 101st d) 103rd

35. Rajya Sabha member has a term of _____ year,
    a) 4   b) 5   c) 6   d) 8

36. The Indian Constitution gives the Power of Amending the constitution to,
    a) Parliament   b) President   c) PM   d) Supreme court of India

37. Who is neutral in the affairs of the party politics,
    a) Chief Minister   b) Home Minister   c) Finance Minister   d) Speaker

38. Legally permissible age of marriage the boys and girls is
    a) 25 & 21   b) 25 & 18   c) 21 & 18   d) 18 & 18

39. This is not a function of the Election commission,
    a) Selection of candidate   b) Preparing Electoral rolls
    c) Issue code of conduct   d) Allotment of symbols

40. Under which Article the President, on Receipt of a Report from the Governor or otherwise, may impose President rule in a state,
    a) 351   b) 352   c) 353   d) 356

41. T.N. Seshan was the _____ of India.
   a) Election commissioner
   b) Chief Election Commissioner
   c) Election observer
   d) Election controller

42. The Chief Justice of High court is appointed by the,
   a) PM   b) CM   c) President   d) Chief Justice of India

43. Who is the Chairman of the Rajya Sabha,
   a) President   b) PM   c) Speaker   d) Vice-President

44. Which of the following Articles provides Right to Protection of Life and Property
   a) 14   b) 19   c) 21   d) 22

45. Bi-Cameral means
   a) One house   b) Two house   c) One+Two houses   d) None of these

46. To Declare National Emergency a decision must be taken by the,
   a) Rajya Sabha   b) Lok Sabha   c) Cabinet   d) Parliament

47. Which of the following is the guardian of the constitution,
   a) President   b) Parliament   c) Lok Sabha   d) Supreme court

48. Re-organisation of States on Linguistic lines was done in _____ Amendment.
   a) 1st b) 3rd c) 5th d) 7th

49. _____ Constitutional Amendment Restricted the Council of Minister to 15% of the legislature membership,
   a) 86th b) 65th c) 78th d) 91st

50. Can the Governor be the Governor for two states,
   a) No   b) Yes   c) One state and One UT   d) 2 UTs

51. Who is the Present Governor of Karnataka,
   a) T N Chaturvedi
   b) Hamsaraj Bhardwaj
   c) Vajubhai Vala
   d) Thawar Chand Gehlot

52. Who is the Present President of India?
   a) Man Mohan Singh
   b) R N Kovid
   c) Amit Shah
   d) Narendra Modi

53. Which was the lengthiest Amendment to Constitution,
   a) 24th b) 42nd c) 43rd d) 44th

54. The commission appointed to investigate the condition of Backward classes was headed by,
   a) Mandal   b) Nanavathi   c) Sarkaria   d) Narasimha

55. The total number of Election Commissioners including the CEC is
   a) 3   b) 4
   c) 5   d) 6

56. _____ Amendment provided for antailment of Fundamental Rights, imposes Fundamental Duties and made changes to the basic structure of the constitution by adding "Socialistic and Secular".
   a) 40th b) 41st c) 42nd d) 44th

57. _____ Administer Oath to the CM of a state.
   a) PM b) President c) Governor d) Chief Justice

58. The Right to enforce fundamental rights is enshrined in article _____ of the constitution.
   a) 12 b) 14 c) 19 d) 32

59. Who is the Supreme Commander of Armed forces in India?
   a) PM b) President c) Chief Justice d) Speaker of Loksabha

60. To become Governor one has to attain the age of ____ year.
   a) 30 b) 35 c) 40 d) 50

61. Engineers can use the code of Ethics as guidelines to,
   a) Resolve the conflicts b) Formulate the problem
   c) Shift the responsibility d) Overcome the work pressure

62. In _____ concept of responsibility, an attention is being paid to those who are the risk of being harmed.
   a) Minamalist b) Reasonable care
   c) Good work view d) All of these

63. In Engineering R and D, retaining the data to draw a non-contradictory statement and discarding the rest is called,
   a) Cooking b) Trimming c) Scanning d) Skimming

64. Stealing of IPR means,
   a) Cooking b) Forgery c) Trimming d) Plagiarism

65. Which of the following is not an impediment to responsibility,
   a) Group think b) Microscopic vision c) Ego-centric d) Trade mark

66. Engineer's expert testimony in technical investigation demand,
   a) Adaquate time for through investigation b) Scanning and skimming information
   c) Smoothing of irregularities to make the data appear accurate and precise.
   d) Retaining and Manipulating data

67. Revealing confidential information Amounts to,
   a) Violation of patent b) Misuse of trust
   c) Breach of contract d) Criminal Breach of trust

68. A professional engineer can take the help of codes of ethics when he has,
   a) Doubts b) Legal problems
   c) Ethical crisis d) Confusion

69. Fear is_____ to responsibility
   a) A way of shift b) an Impediment
   c) Way to corrupt d) All of these

70. Engineer may not be held legally liable for causing harm, when the harm is caused,
    a) Intentionally
    b) Ignorantly
    c) Negligently
    d) Recklessly

71. Which of the following is NOT preserved as an Intellectual property?
    a) Copy rights
    b) Patents
    c) Trade secrets
    d) Government regulation

72. It is not a kind of trade mark,
    a) Designs
    b) Symbols
    c) Sounds
    d) Goodwill

73. This is not dishonesty in Engineering Research and Testing,
    a) Crimping
    b) Forging
    c) Cooking
    d) Plagiarism

74. Ego centric tendencies mean,
    a) Superiority complex
    b) Interpreting situation from a limited view
    c) Arrogant and irresponsible behaviour
    d) Habit of condemning the views of others

75. No code will be give _____ to get solution for ethical problems,
    a) Guidelines
    b) Set of Ideas
    c) An algorithm
    d) Ethical standard

76. Which of the following is not considered the aim of engineering ethics,
    a) Moral imagination
    b) Identification of ethical issues
    c) Development of analytical skills
    d) Responsibility shifting

77. The public is put to increased risk by allowing increased number of deviation from specific safety standard and acceptable risk is known as,
    a) Normal accident
    b) Normalising deviation
    c) Risk assessment
    d) Over estimated risk

78. Which of the following is basic attitude towards responsibility,
    a) Vigilant view
    b) Minimalist view
    c) Moralist view
    d) All of these

79. A fault tree is used to,
    a) Assess the risk involved
    b) To claim compensation
    c) Take free consent
    d) To improve safety

80. Cooking means,
    a) Boiling under pressure
    b) Retaining results which fit the theory
    c) Making deceptive statements
    d) Misleading the public.

81. What is the name of the IT Law that India is having in the Indian legislature?
    a) India's Technology (IT) Act, 2000
    b) India's Digital Information Technology Act (DIT) 2000
    c) India's Information Technology Act (IT), 2000
    d) The Technology Act, 2008

82. Under which section of IT Act, stealing any digital asset or information is written a cyber crime,
    a) 65
    b) 65-D
    c) 67
    d) 70

83. Download copy, extract data from an open system done fraudulently is treated as _____,
    a) Cyber –warfare   b) Cyber security Act   c) Data-back up   d) Cyber-crime

84. Any digital content, which any incidental crates and is not acceptable to the society it's a cyber crime that comes under _____ of IT Act.
    a) Section 66   b) Section 67   c) Section 68   d) Section 69

85. IT Act 2008 make cyber crime details more precise where it mentioned if anyone publishes sexually explicit digital content then under _____ of IT Act, 2008 he/she has to pay a legitimate amount of fine,
    a) Section 67-A   b) Section 67-B   c) Section 67-C   d) Section 67-D

86. Which section of IT Act deals with the appointment of controller of certifying authorities?
    a) Section 5   b) Section 15   c) Section 10   d) Section 17

87. IT 2000 amended various sections of which of the following Acts?
    a) Indian Penal Code1860
    b) Reserve Bank of India, Act 1934
    c) Indian Evidence Act and Bankers Book Evidence Act 1891
    d) All the above

88. Which section of IT Act deals with child pornography?
    a) Section 67 A   b) Section 67 B   c) Section 67 F   d) Section 67 C

89. Repeated harassment and threatening behavior towards someone through internet or email is known as,
    a) Cyber Phishing   b) Cyber defamation   c) Cyber stalking   d) Cyber spoofing

90. Unauthorised control/access over computer system and destroying computer data and program is known as,
    a) Cracking   b) Hacking   c) Piracy   d) Cyber smear

91. What is the maximum term of punishment for hacking a computer system as per IT Act 2000?
    a) 1 year   b) 3 years   c) 5 years   d) 4 years

92. Any criminal entity that uses computer as a instrumentality/Target or means for perpetuating further crimes comes within one ambit of,
    a) Software piracy   b) Cyber crimes
    c) Conventional crimes   d) Data crimes

93. Private key is used to,
    a) Digitally sign   b) Verify the sign
    c) Verify the door stage   d) Make payments

94. _____ means a person who has been granted a license to issue a digital signature certificate,
    a) Controller   b) Certifying authority   c) Certified issuer   d)Licensed authority

95. _____ is a person in whose name the digital signature certificate is issued,
    a) Certified authority   b) Subscriber
    c) Holder   d) Controller

96. UNICITRAL stands for _____
   a) United Nations Centre for Indian Trade law.
   b) United nations Commission on International Trade Laws.
   c) United Nations Commission for Indian Trade Law.
   d) United Nations Commission for Information Trade Laws.

97. _____ is known as publication without justification or lawful excuse which tends to injure the reputation of person by exposing that person hatred and contempt.
   a) Cyber Squatting   b) Cyber defamation
   c) Cyber Stalking   d) Cyber phishing

98. Which are the sections of IT Act applicable for cyber pornography?
   a) 66, 66A, 66B   b) 67, 67A, 67B
   c) 67, 67C, 67D   d) None of the above

99. Which section deals with the use of electronic records and digital signature in government and its agencies?
   a) Section 3   b) Section 5   c) Section 6   d) Section 7

100. Which is the appeal court on the orders issued by cyber appellate tribunal?
   a) Munsiff court   b) District court   c) High Court   d) Supreme court

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CBCS SCHEME

Third Semester B.E. Degree Examination, July/August 2021
Additional Mathematics – I

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions.

1. a. Show that $(1 + \cos\theta + i\sin\theta)^n + (1 + \cos\theta - i\sin\theta)^n = 2^{n+1}\cos^n\left(\dfrac{\theta}{2}\right)\cos\left(\dfrac{n\theta}{2}\right)$. **(07 Marks)**

   b. Express $1 - i\sqrt{3}$ in polar form and hence find its modulus and amplitude. **(06 Marks)**

   c. Express $\dfrac{1}{1 - \cos\theta + i\sin\theta}$ in the form $a + ib$ and also find its conjugate. **(07 Marks)**

2. a. Define dot product between two vectors A and B. Find the sine of the angle between the vectors $\vec{A} = 2\hat{i} - 2\hat{j} + \hat{k}$ and $\vec{B} = \hat{i} - 2\hat{j} + 2\hat{k}$. **(07 Marks)**

   b. If $\vec{A} = \hat{i} - 2\hat{j} + 3\hat{k}$, $\vec{B} = -\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{C} = 3\hat{i} + \hat{j}$, find the value of p such that $\vec{A} - p\vec{B}$ is perpendicular to $\vec{C}$. **(06 Marks)**

   c. Find $\vec{a}\cdot(\vec{b}\times\vec{c})$, $\vec{b}\times(\vec{a}\times\vec{c})$ and $\vec{c}\cdot(\vec{a}\times\vec{b})$ where $\vec{a} = \hat{i} + \hat{j} - \hat{k}$, $\vec{b} = 2\hat{i} - \hat{j} + 2\hat{k}$, $\vec{c} = 3\hat{i} - \hat{j} - \hat{k}$. **(07 Marks)**

3. a. Obtain the Maclaurin's series expansion of $\log(\sec x)$ upto the terms containing x^6. **(07 Marks)**

   b. If $u = \tan^{-1}\left(\dfrac{x^3 + y^3}{x - y}\right)$ then using Euler's theorem, prove that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} = \sin 2u$. **(06 Marks)**

   c. If $u = f(x - y, y - z, z - x)$, prove that $\dfrac{\partial u}{\partial x} + \dfrac{\partial u}{\partial y} + \dfrac{\partial u}{\partial z} = 0$. **(07 Marks)**

4. a. Obtain the Maclaurin's series expansion of the function $\sqrt{1 + \sin 2x}$ upto x^4. **(07 Marks)**

   b. If $u = e^{\frac{x^2 y^2}{x+y}}$, prove that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} = 3u\log u$ using Euler's theorem. **(06 Marks)**

   c. If $u = \dfrac{yz}{x}$, $v = \dfrac{zx}{y}$, $w = \dfrac{xy}{z}$ then show that $\dfrac{\partial(u, v, w)}{\partial(x, y, z)} = 4$. **(07 Marks)**

5. a. A particle moves along a curve $x = 3t^2$, $y = t^3 - 4t$, $z = 3t + 4$ where t is the time variable. Determine the components of velocity and acceleration vectors at $t = 2$ in the direction $\hat{i} - 2\hat{j} + 2\hat{k}$. **(07 Marks)**

   b. Find the unit normal vector to the surface $xy^3z^2 = 4$ at the point $(-1, -1, 2)$. **(06 Marks)**

   c. Show that the vector field $\vec{F} = (2x + yz)\hat{i} + (4y + zx)\hat{j} - (6z - xy)\hat{k}$ is irrotational. Also find ϕ such that $\vec{F} = \nabla\phi$. **(07 Marks)**

6 a. Find $\text{div}\,\vec{F}$ and $\text{Curl}\,\vec{F}$, where $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$. (07 Marks)

b. If $\vec{F} = (3x^2 y - z)\hat{i} + (xz^3 + y^4)\hat{j} - 2x^3 z^2 \hat{k}$ then find $\nabla \cdot \vec{F}$, $\nabla \times \vec{F}$ and $\nabla \cdot (\nabla \times \vec{F})$ at $(2, -1, 0)$. (06 Marks)

c. Determine the constant 'a' such that the vector $(2x + 3y)\hat{i} + (ay - 3z)\hat{j} + (6x - 12z)\hat{k}$ is Solenoidal. (07 Marks)

7 a. Obtain a reduction formula for $\displaystyle\int_0^{\pi/2} \cos^n x\, dx\, (n > 0)$. (07 Marks)

b. Evaluate $\displaystyle\int_0^a x^4 \sqrt{a^2 - x^2}\, dx$. (06 Marks)

c. Evaluate $\displaystyle\int_1^5 \int_1^{x^2} x(x^2 + y^2)\, dx\, dy$. (07 Marks)

8 a. Obtain a reduction formula for $\displaystyle\int_0^{\pi/2} \sin^n x\, dx\, (n > 0)$. (07 Marks)

b. Evaluate $\displaystyle\int_0^{2a} x^2 \sqrt{2ax - x^2}\, dx$ (06 Marks)

c. Evaluate $\displaystyle\int_{-1}^{1} \int_0^z \int_{x-z}^{x+z} (x + y + z)\, dy\, dx\, dz$ (07 Marks)

9 a. Solve $(2x^3 - xy^2 - 2y + 3)dx - (x^2 y + 2x)dy = 0$ (07 Marks)

b. Solve $\dfrac{dy}{dx} - y\tan x = y^2 \sec x$. (06 Marks)

c. Solve $3x(x + y^2)dy + (x^3 - 3xy - 2y^3)dx = 0$ (07 Marks)

10 a. Solve $\dfrac{dy}{dx} + y\cot x = \sin x$. (07 Marks)

b. Solve $(x + 3y - 4)dx + (3x + 9y - 2)dy = 0$ (06 Marks)

c. Solve $[1 + (x + y)\tan y]\dfrac{dy}{dx} + 1 = 0$ (07 Marks)

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