USN ☐☐☐☐☐☐☐☐☐☐   18MAT31

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

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1   a.   Find the Laplace transform of $\cos t\ \cos 2t\ \cos 3t$.   **(06 Marks)**

   b.   If $f(t) = \begin{cases} t, & 0 < t < a \\ 2a - t, & a < t < 2a \end{cases}$ and $f(t + 2a) - f(t)$, show that $L\{f(t)\} = \dfrac{1}{s^2} \tan h \left(\dfrac{as}{2}\right)$.

         (07 Marks)

   c.   Find the Inverse Laplace transforms of :

     i) $\dfrac{2s+1}{s^2 + 6s + 13}$ ii) $\dfrac{1}{3} \log\left(\dfrac{s^2 + b^2}{s^2 + a^2}\right)$.   **(07 Marks)**

OR

2   a.   Express the function f(t) in terms of unit step function and find its Laplace transform, where

     $f(t) = \begin{cases} 1, & 0 < t \le 1 \\ t, & 1 < t \le 2 \\ t^2, & t > 2 \end{cases}$.   **(06 Marks)**

   b.   Find the Inverse Laplace transform of $\dfrac{s^2}{(s^2 + a^2)^2}$ using Convolution theorem.   **(07 Marks)**

   c.   Solve by the method of Laplace transforms, the equation $y'' + 4y' + 3y = e^{-t}$ given $y(0) = 0$, $y'(0) = 0$.   **(07 Marks)**

Module-2

3   a.   Obtain the Fourier series of the function $f(x) = x^2$ in $-\pi \le x \le \pi$.   **(06 Marks)**

   b.   Obtain the Fourier series expansion of

     $f(x) = \begin{cases} x, & 0 < x < \pi \\ x - 2\pi, & \pi < x < 2\pi \end{cases}$.   **(07 Marks)**

   c.   Find the Cosine half range series for $f(x) = x(\ell - x)$, $0 \le x \le \ell$.   **(07 Marks)**

OR

4   a.   Obtain the Fourier series of $f(x) = |x|$ in $(-\ell, \ell)$.   **(06 Marks)**

   b.   Find the sine half range series for

     $f(x) = \begin{cases} x, & 0 < x < \pi/2 \\ \pi - \pi, & \pi/2 \le x < \pi \end{cases}$.   **(07 Marks)**

   c.   Obtain the constant term and the coefficients of the first cosine and sine terms in the Fourier expansion of y from the table.   **(07 Marks)**

x	0	1	2	3	4	5
y	9	18	24	28	26	20

Module-3

5 a. If $f(x) = \begin{cases} 1-x^2 & , \ |x| < 1 \\ 0 & , \ |x| \geq 1 \end{cases}$. Find the Fourier transform of f(x) and hence find value of

$$\int_0^\infty \frac{x\cos x - \sin x}{x^3} \, dx.$$ **(06 Marks)**

   b. Find the Fourier Cosine transform of

$$f(x) = \begin{cases} 4x, & 0 < x < 1 \\ 4-x, & 1 < x < 4 \cdot \\ 0, & x > 4 \end{cases}$$ **(07 Marks)**

   c. Find the Z – transform of $\cos\left(\dfrac{n\pi}{2} + \dfrac{\pi}{4}\right)$. **(07 Marks)**

OR

6 a. Solve the Integral equation

$$\int_0^\infty f(\theta)\cos\alpha\,\theta\,d\theta = \begin{cases} 1-\alpha & , \ 0 \leq \alpha \leq 1 \\ 0 & , \ \alpha > 1 \end{cases} \text{ hence evaluate } \int_0^\infty \frac{\sin^2 t}{t^2}\,dt.$$ **(06 Marks)**

   b. Find the Inverse Z – transform of $\dfrac{2z^2 + 3z}{(z+2)(z-4)}$. **(07 Marks)**

   c. Using the Z – transform, solve $Y_{n+2} - 4Y_n = 0$, given $Y_0 = 0$, $Y_1 = 2$. **(07 Marks)**

Module-4

7 a. Using Taylor's series method, solve the Initial value problem

$$\frac{dy}{dx} = x^2 y - 1 \ , \ y(0) = 1 \text{ at the point } x = 0.1. \text{ Consider upto } 4^{th} \text{ degree term.}$$ **(06 Marks)**

   b. Use modified Euler's method to compute y(0.1), given that $\dfrac{dy}{dx} = x^2 + y$, y(0) = 1 by taking

h = 0.05. Consider two approximations in each step. **(07 Marks)**

   c. Given that $\dfrac{dy}{dx} = x - y^2$, find y at x = 0.8 with

x :	0	0.2	0.4	0.6
y :	0	0.02	0.0795	0.1762

By applying Milne's method. Apply corrector formula once. **(07 Marks)**

OR

8 a. Solve the following by Modified Euler's method

$$\frac{dy}{dx} = x + |\sqrt{y}| \ , \ y(0) = 1 \text{ at } x = 0.4 \text{ by taking } h = 0.2. \text{ Consider two modifications in each}$$

step. **(06 Marks)**

   b. Given $\dfrac{dy}{dx} = 3x + \dfrac{y}{2}$, y(0) = 1. Compute y(0.2) by taking h = 0.2 using Runge – Kutta

method of order IV. **(07 Marks)**

   c. Given $\dfrac{dy}{dx} = (1+y)x^2$ and y(1) = 1 , y(1.1) = 1.233 , y(1.2) = 1.548 , y(1.3) = 1.979,

determine y(1.4) by Adam's Bashforth method. Apply corrector formula once. **(07 Marks)**

Module-5

9 a. Given $y'' - xy' - y = 0$ with $y(0) = 1$, $y'(0) = 0$. Compute $y(0.2)$ using Runge – Kutta method. **(06 Marks)**

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

c. Prove that the geodesics on a plane are straight lines. **(07 Marks)**

OR

10 a. Find the curve on which functional

$$\int_0^1 [(y')^2 + 12xy]dx \text{ with } y(0) = 0, y(1) = 1 \text{ can be extremized.}$$ **(06 Marks)**

b. Obtain the solution of the equation $\dfrac{2d^2y}{dx^2} = 4x + \dfrac{dy}{dx}$ by computing the value of dependent variable corresponding to the value 1.4 of the independent variable by applying Milne's method using the following data. Apply corrector formula once. **(07 Marks)**

x :	1	1.1	1.2	1.3
y :	2	2.2156	2.4649	2.7514
y' :	2	2.3178	2.6725	3.0657

c. A heavy cable hangs freely under gravity between two fixed points. Show that the shape of the cable is Catenary $y = c \cosh\left(\dfrac{x+a}{c}\right)$. **(07 Marks)**

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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐ **18EC32**

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Network Theory

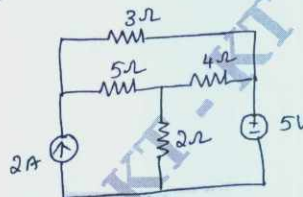Time: 3 hrs.   Max. Marks: 100

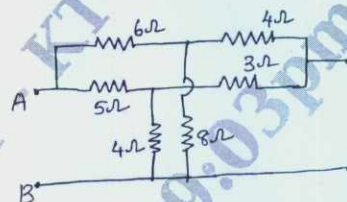*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Using source transformation and source shifting techniques, find voltage across 2Ω resistor as shown in Fig.Q.1(a). **(07 Marks)**
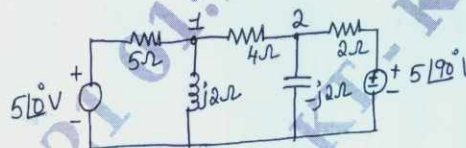

Fig.Q.1(a)

b. For the network shown in Fig.Q.1(b), find the equivalent resistance between A and B using Star-Delta transformation. **(05 Marks)**

Fig.Q.1(b)

c. Determine the node voltages V_1 and V_2 by nodal analysis for the network in Fig.Q.1(c). **(08 Marks)**
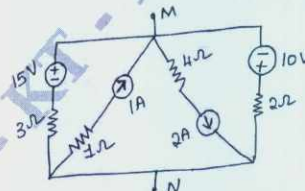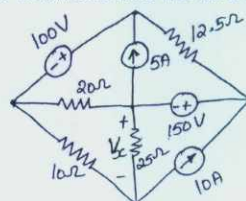

Fig.Q.1(c)

OR

2 a. Find the potential difference between M and N using source transformation, for the network shown in Fig.Q.2(a). **(05 Marks)**
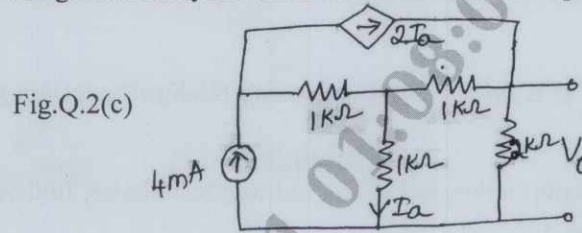

Fig.Q.2(a)

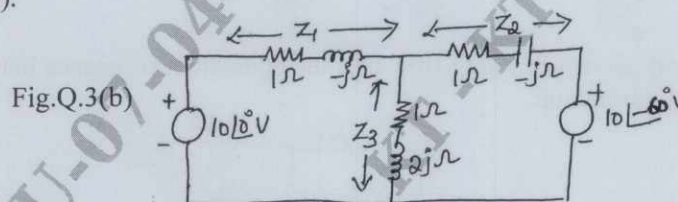b. Find V_x using nodal analysis for the network shown in Fig.Q.2(b). **(08 Marks)**

Fig.Q.2(b)

1 of 4

c. Determine V_0 using mesh analysis for the network shown in Fig.Q.2(c). **(07 Marks)**

Fig.Q.2(c)

Module-2

3   a. State and prove Millman's theorem. **(06 Marks)**
    b. Find the current through Z_3 using superposition theorem for the network shown in Fig.Q.3(b). **(10 Marks)**

Fig.Q.3(b)

c. Find the value of Z_L for which maximum power transfer occurs in the network shown in Fig.Q.3(c). **(04 Marks)**

Fig.Q.3(c)
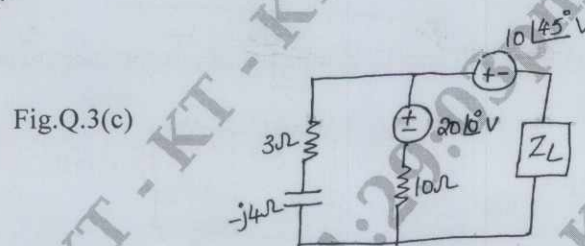
OR

4   a. Obtain Thevenin's and Norton's equivalent circuit at terminals AB for the network shown in Fig.Q.4(a). Hence, find the current through 10Ω resistor across AB. **(12 Marks)**
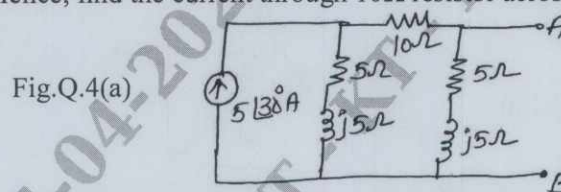
Fig.Q.4(a)

b. Find the value of R_L for which maximum power is delivered. Also find the maximum power that is delivered to the load R_L. Refer Fig.Q.4(b). **(08 Marks)**

Fig.Q.4(b)

Module-3

5 a. In the given network Fig.Q.5(a), K is closed at t = 0, with zero current in the inductor. Find the values of i, $\dfrac{di}{dt}$ and $\dfrac{d^2i}{dt^2}$ at t = 0$^+$. **(05 Marks)**
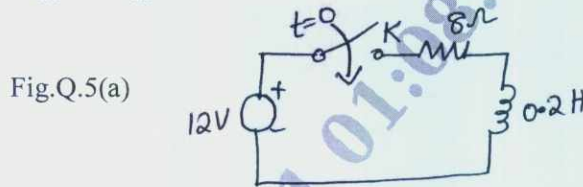
Fig.Q.5(a)

b. In the network Fig.Q.5(b), the switch is moved from position 1 to position 2 at t = 0. The steady-state has been reached before switching. Calculate i, $\dfrac{di}{dt}$ and $\dfrac{d^2i}{dt^2}$ at t = 0$^+$. **(07 Marks)**
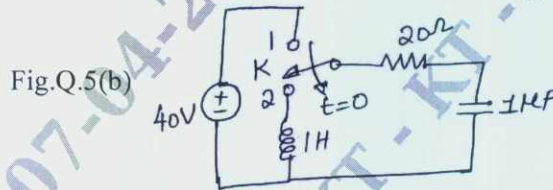
Fig.Q.5(b)

c. In the network Fig.Q.5(c), the switch K is opened at t = 0. At t = 0$^+$, solve for v, $\dfrac{dv}{dt}$ and $\dfrac{d^2v}{dt^2}$. **(08 Marks)**

Fig.Q.5(c)
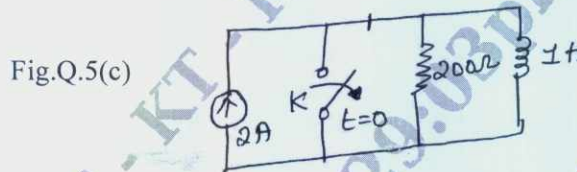
OR

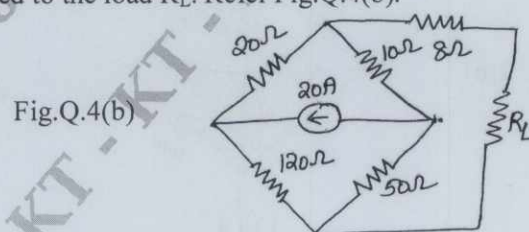**6** a. For the circuit shown in Fig.Q.6(a), steady state is reached with switch K open. The switch is closed at t = 0. Find i_1, i_2, $\dfrac{di_1}{dt}$ and $\dfrac{di_2}{dt}$ at t = 0$^+$. **(10 Marks)**
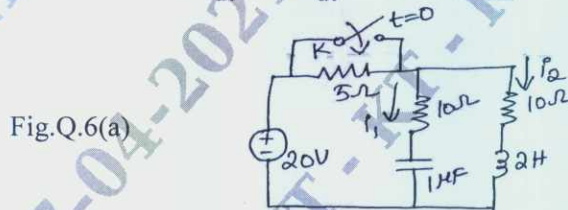
Fig.Q.6(a)

b. For the circuit in Fig.Q.6(b). Find:
   i)   v(0$^+$) and i(0$^+$)
   ii) $\dfrac{dv(0^+)}{dt}$ and $\dfrac{di(0^+)}{dt}$
   iii) v(∞) and i(∞). **(10 Marks)**

Fig.Q.6(b)
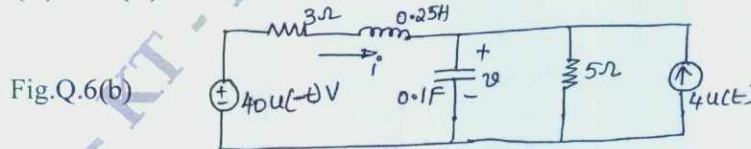
Module-4

7 a. Determine the current $i_L(t)$ for $t \geq 0$ for the circuit in Fig.Q.7(a). (10 Marks)
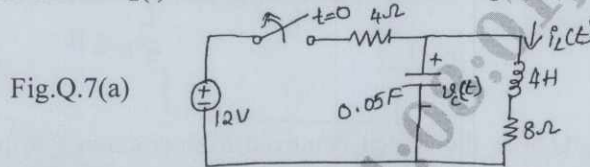
Fig.Q.7(a)

b. Find the Laplace transform of the function f(t) shown in Fig.Q.7(b). (10 Marks)
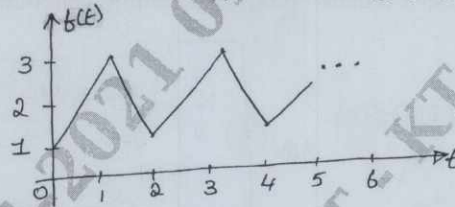
Fig.Q.7(b)

OR

8 a. Determine the voltage $v_c(t)$ and the current $i_c(t)$ for $t \geq 0$ for the circuit shown in Fig.Q.8(a). (10 Marks)
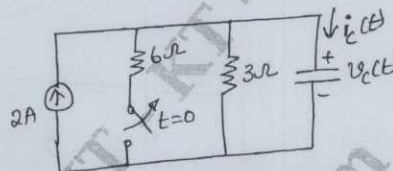
Fig.Q.8(a)

b. Find the Laplace transform of f(t) shown in Fig.Q.8(b). (10 Marks)
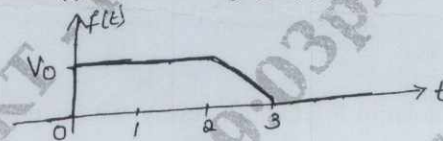
Fig.Q.8(b)

Module-5

9 a. Express Y parameters in terms of h-parameters. (06 Marks)
   b. Find Z-parameters for the network shown in Fig.Q.9(b). (06 Marks)
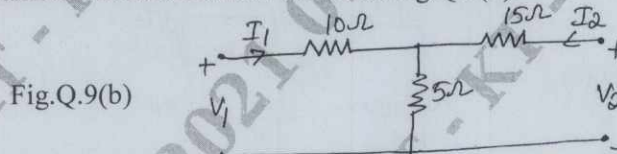
Fig.Q.9(b)

c. The Z-parameters of a two port network are $z_{11} = 20\Omega$, $z_{22} = 30\Omega$, $z_{12} = z_{21} = 10\Omega$. Find Y and ABCD parameters of the network. (08 Marks)

OR

10 a. Prove that the resonant frequency is the geometric mean of the two half power frequencies. (06 Marks)

b. A series RLC circuit has R = 10Ω, L = 0.01H and C = 0.01μF and it is connected across 10mv supply. Calculate: i) f_0 ii) Q_0 iii) bandwidth iv) f_1 and f_2 v) I_0. (06 Marks)

c. Find the value of R_1 such that the circuit shown in Fig.Q.10(c) is resonant. (08 Marks)

Fig.Q.10(c)

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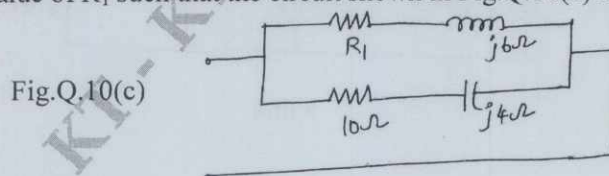
USN | | | | | | | | | | **18EC33**

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Electronic Devices

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Write the figures of the resulting orbitals when isolated atoms brought together and explain the characteristics.   **(10 Marks)**

   b. Obtain the relationship between mobility and hall coefficient in a p-type bar placed in a magnetic field in the Z-direction.   **(10 Marks)**

OR

2 a. Derive the equation which relates current density and mobility in a semiconductor in an applied electric field.   **(10 Marks)**

   b. A silicon bar $2\mu m$ long and $200\mu m^2$ in cross sectional area is doped with $1.5 \times 10^{17}/cm^3$ phosphorus. Find the current at 300K with 30V applied voltage. How long does it take an average electron to drift $2\mu m$ in pure silicon at an electric field of 80V/cm? Also calculate the time required at 10^5V/cm. Assume mobility of electrons is $0.1350m^2$/Vsec. Also assume that saturation of electron drift velocity for silicon is 10^7 cm/s for the electric field above 10^5 V/cm.   **(10 Marks)**

Module-2

3 a. Show the effect of bias at a pn junction on transition region width, electric field, electrostatic potential, energy band diagram partic flow and current direction under the following conditions:
   i)   Equilibrium   ii) Forward bias   iii) Reverse bias.   **(10 Marks)**

   b. Illustrate the care and issues to be considered in the design of solar cells.   **(10 Marks)**

OR

4 a. Explain Avalanche break down and obtain equation for the electron multiplication factor.   **(10 Marks)**

   b. Derive the relationship between the open circuit voltage and optic generation rate starting from the expression for the optically generated illuminated pn junction.   **(10 Marks)**

Module-3

5 a. Show the hole and electron flow in a pnp transistor with proper biasing.   **(08 Marks)**

   b. For the circuit shown in Fig.Q.5(b) calculate β, I_B and I_C. Given that τ_p =18μs, and τ_t = 0.2μs. What happens to the output current when I_B increases and β increases?

Fig.Q.5(b)
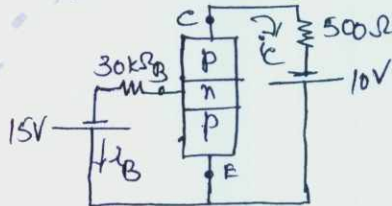
(06 Marks)

   c. Explain the concept of base narrowing in a $p^+ - n - p^+$ transistor.   **(06 Marks)**

OR

6   a.   Obtain the Ebers-Moll equations and represent the same in the model form.   **(12 Marks)**
    b.   Describe the switching effects in a CE transistor circuit.   **(08 Marks)**

Module-4

7   a.   Analyze the effect on gate-to-channel-space charge region and IV characteristics for the following conditions in a JFET:
         i)   Zero gate voltage of a small drain voltage
         ii)   Zero gate voltage of a large drain voltage
         iii) Small V_{DS} value and small reverse-biased gate voltage.   **(10 Marks)**
    b.   Draw the energy band diagram in an MOS capacitor structure for the following cases:
         i)   p-type substrate for a positive gate bias
         ii)   p-type substrate for a large positive gate bias
         iii) n-type substrate for a positive gate bias.   **(10 Marks)**

OR

8   a.   Write the small signal equivalent circuit of a JFET, ideal low frequency small signal equivalent circuit and ideal equivalent circuit including r_s.   **(10 Marks)**
    b.   Show the channel formation in the MOS structure and I_D versus V_{DS} curve for the following cases:
         i) $V_{gs} > V_t$ and small V_{DS} value
         ii) $V_{gs} > V_t$ and large V_{DS} value
         iii) $V_{gs} > V_t$ and $V_{DS} = V_{DS}$ (sat)   **(10 Marks)**

Module-5

9   a.   What are the fabrication steps used in the fabrication of pn junctions?   **(10 Marks)**
    b.   With figures, describe the complementary MOS structure.   **(10 Marks)**

OR

10 a.   Illustrate the evolution of integrated circuits.   **(10 Marks)**
    b.   Explain the formation of resistors in integrated circuits.   **(10 Marks)**

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18EC34

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Digital System Design

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Design a logic circuit that has 4 inputs, the output will be high, when the majority of the inputs are high. Use K-map to simplify. **(07 Marks)**
   b. Express the following functions into canonical form:
      (i) $f_1 = ab' + ab' + bc$ (ii) $f_2 = (a + b')(b' + c)$ **(06 Marks)**
   c. Identify all the prime implicants and essential prime implicants of the following using K-map.
      i) $f(a, b, c, d) = \Sigma m(6, 7, 9, 10, 13) + dc(1, 4, 5, 11, 15)$
      ii) $f(a, b, c, d) = \pi M(1, 2, 3, 4, 9, 10) + dc(0, 14, 15)$
      iii) $F(w, x, y, z) = \Sigma(0, 2, 4, 5, 6, 7, 8, 10, 13, 15)$ **(07 Marks)**

OR

2 a. Simplify the following using tabulation methods:
      $Y = \Sigma m(1, 2, 3, 5, 9, 12, 14, 15) + \Sigma d(4, 8, 11)$ **(07 Marks)**
   b. Simplify the following expression using K-map. Implement the simplified expression using NAND gates only. $F = \Sigma m(0, 1, 2, 5, 6, 7, 8, 9, 10, 13, 14, 15)$. **(07 Marks)**
   c. Explain briefly K-map, incompletely specified functions, essential prime implicants and gray codes. **(06 Marks)**

Module-2

3 a. Design a two bit magnitude comparator. **(10 Marks)**
   b. Realize the following functions expressed in maxterm canonical form in two possible ways using 3:8 decodes. $f_1(a, b, c) = \pi M(1, 2, 6, 7)$ and $f_2(a, b, c) = \pi M(1, 3, 6, 7)$ **(10 Marks)**

OR

4 a. Implement $f(a, b, c, d) = \Sigma m(0, 1, 5, 6, 7, 9, 10, 15)$, using;
      (i) 8:1 mux with a, b, c, as select lines   (ii) 4:1 mux with a, b as select lines. **(08 Marks)**
   b. Explain 4-bit carry look-ahead adder with necessary diagram and relevant expressions. **(04 Marks)**
   c. Draw a PLA circuit to implement the logic function $A'BC + AB'C + AC'$ and $A'B'C' + BC$. **(08 Marks)**

Module-3

5 a. Explain with timing diagrams the workings of SR latch as a switch debouncer. **(08 Marks)**
   b. What is race around condition? Explain JK Master Slave flipflop with a diagram, function table and timing diagram. **(07 Marks)**
   c. List the difference between combinational and sequential circuits. **(05 Marks)**

OR

6 a. Explain the operation of clocked SR flipflop using NAND gates. **(07 Marks)**
   b. What is the significance of Edge Triggering? Explain the working of positive edge triggered D-FF with their function table. **(07 Marks)**
   c. Explain the working of 4-bit twisted ring counter using necessary diagram and logic table. **(06 Marks)**

Module-4

7 a. Using positive edge triggering SR flipflops design a counter which counts in the following sequence: 000, 111, 110, 101, 100, 011, 010, 001, 000 … **(10 Marks)**
   b. Design a synchronous mod-6 counter using D-flipflop to generate the sequence (0, 2, 3, 6, 5, 1, 0) **(10 Marks)**

OR

8 a. Write the difference between Mealy and Moore model with necessary diagrams. **(10 Marks)**
   b. Explain state machine notations with an example. **(10 Marks)**

Module-5

9 a. Construct Mealy state diagram that will detect input sequence 10110, when input pattern is detected, Z is asserted high. Give state diagram for each state. **(10 Marks)**
   b. With necessary diagram, explain the concept of serial adder with accumulators. **(10 Marks)**

OR

10 a. Design a sequential circuit to convert BCD to excess 3 code. **(10 Marks)**
   b. Explain the design of sequential circuit using CPLD's and give CPLD implementation of a shift register and parallel adder with accumulator. **(10 Marks)**

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USN | | | | | | | | | | 18EC35

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Computer Organization and Architecture

Time: 3 hrs.   Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Write neat diagrams wherever necessary.

Module-1

1   a. With a neat diagram, describe the functional units of a computer. Give few examples for I/O devices. **(06 Marks)**
    b. Discuss IEEE standard for single-precision and double-precision floating point numbers, with standard notations. **(06 Marks)**
    c. Develop an Assembly Language Program (ALP) for the expression $Y = Ax^2 + BCx + D$ using 3-address, 2-address and 1-address instruction formats. Assume A, B, C, D, Y as memory locations and x as immediate data. **(08 Marks)**

OR

2   a. With a neat diagram, discuss the operational concepts in a computer highlighting the role of PC, MAR, MDR and IR. **(08 Marks)**
    b. Perform subtraction on the following pairs of numbers using 5-bit signed 2's-complement format. Indicate about overflow in each case:
        i) +10 and -8   ii) +12 and +9   iii) -15 and -9   iv) -14 and +5   **(08 Marks)**
    c. Distinguish between Big-endian and little-endian memory assignment. With a neat sketch, show how the number 26789435 is stored using these methods. **(04 Marks)**

Module-2

3   a. Define addressing mode. Explain any four basic addressing modes with syntax and examples. **(08 Marks)**
    b. What is subroutine? With a pseudocode or program segment, illustrate parameter passing using registers. **(06 Marks)**
    c. Consider a database of marks scored by students in 3 tests, stored in memory starting at address LIST. Each student record consists of studentID followed by marks in 3 tests. Assume each of these to be 4 bytes in size. There are 50 students in the class and this value is stored at location NUM.
        i)   Sketch the memory map showing all details
        ii) Develop an ALP using Indexed Addressing mode, to compute the sum of scores by all the students in Test2 and store the result in location SUM. Write appropriate comments. **(06 Marks)**

OR

4   a. Discuss Auto-increment and Auto-decrement addressing modes with syntax. Consider a set of numbers (each 4 bytes in size) stored in memory starting at address TABLE. Total numbers are N and this value is stored at location LOCN.
        i)   Sketch the memory map showing all details
        ii) Develop an ALP using Auto-increment addressing mode, to compute the sum of all numbers and store the result at memory address RESUTL. Write appropriate comments. **(08 Marks)**

b. Define stack. Explain PUSH and POP operations on stack with neat sketches and examples. **(06 Marks)**

c. Consider a register R1 to size 16-bits with initial data 5867_d. With neat sketches, depict the output in each case, after performing the following operations:
   i)   LshiftL #2, R1   ii) AshiftR #1, R1   iii) RotateR #1, R1
   Note: For each operation, R1 value is to be taken as 5867_d and carry flag is indicated cleared. **(06 Marks)**

Module-3

5 a. Distinguish between memory mapped I/O and standard I/O. Write a program segment to read a line of text from keyboard and display it. **(08 Marks)**

 b. What is interrupt priority? Why is it necessary? With relevant diagram, discuss daisy-chain method of handling multiple interrupt requests. **(06 Marks)**

 c. Explain distributed arbitration mechanism in DMA with a neat diagram. **(06 Marks)**

OR

6 a. With a neat diagram, discuss implementation of interrupt priority using individual request and acknowledge lines. **(06 Marks)**

 b. Briefly explain: i) Vectored interrupts and ii) Registers in a DMA interface. **(06 Marks)**

 c. Explain centralized arbitration mechanism in DMA with a neat sketch and timing diagram. **(08 Marks)**

Module-4

7 a. Classify memory in a computer. With a neat diagram, describe the organization of $2M \times 8$ DRAM chip. **(08 Marks)**

 b. What is cache memory? Explain direct mapping technique with a neat diagram. **(08 Marks)**

 c. Briefly discuss the concept of virtual memory with a diagram. **(04 Marks)**

OR

8 a. Briefly explain the working of 1-bit CMOS SRAM cell with a schematic. **(06 Marks)**

 b. What is mapping function? Explain set-associative cache mapping technique with a relevant diagram. **(08 Marks)**

 c. With a neat diagram, explain the principle of working of magnetic disk. **(06 Marks)**

Module-5

9 a. Explain single-bus organization of data path in a processor with a neat diagram. Highlight the importance of gating signals. **(08 Marks)**

 b. Develop the complete control signal sequence for the instruction Add (R1), R3 with appropriate remarks. **(06 Marks)**

 c. Discuss micro programmed control unit design with relevant diagrams. **(06 Marks)**

OR

10 a. List different ways of improving CPU performance. With a neat diagram, discuss three-bus organization of CPU. Compare the performance with single-bus organization. **(08 Marks)**

 b. Discuss Hardwired control unit organization with relevant diagrams and illustrate the logic to generate Z_{in} control signal. **(08 Marks)**

 c. Define the following:
   i) Gating signal   ii) Control word   iii) Microroutine   iv) Control store. **(04 Marks)**

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18EC36

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Power Electronics and Instrumentation

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a.   Discuss various power converter circuits with necessary sketches and applications of each. **(07 Marks)**

    b.   With necessary sketches, explain the static V-I characteristics of SCR and its operation. **(08 Marks)**

    c.   List different turn-on methods, explain all in brief. **(05 Marks)**

OR

2   a.   Explain turn-ON/turn-OFF dynamic characteristics of SCR with neat diagram. **(07 Marks)**

    b.   With suitable diagram and waveform, explain the working of RC full wave firing circuit. **(08 Marks)**

    c.   Describe the operation of UJT with neat sketches. **(05 Marks)**

Module-2

3   a.   Explain the working of 1ϕ full wave center tapped controlled rectifier for resistive load with necessary sketches and also develop mathematical model to evaluate performance parameter of same (V_{dc}, V_{rms}, Efficiency). **(10 Marks)**

    b.   Evaluate performance parameter of 1ϕ half controlled rectifier with resistive load, has a transformer secondary voltage of 230V, 50Hz with R = 10Ω and firing angle $\alpha = 60°$. Determine:
  - i)   Average voltage and current
  - ii)   Rms value of voltage and current
  - iii)   Efficiency
  - iv)   Ripple factor
  - v)   Form factor. **(10 Marks)**

OR

4   a.   Input to the step-up chopper is 200V the output required is 600V, if the conduction time of thyristor is 200μsec. Compute:
  - i)   Chopping frequency
  - ii)   If the pulse width is halved for constant frequency operation, find the new output voltage. **(07 Marks)**

    b.   Explain the operation step-up chopper with neat diagram and derive an expression for output voltage. **(08 Marks)**

    c.   Elaborate on the control techniques used in choppers and also give detailed classification of choppers. **(05 Marks)**

Module-3

5 a. With neat circuit diagram and waveforms. Explain the operation of 1φ full bridge inverter for RL load. **(07 Marks)**

   b. Design a multi range ammeter with range 0-1A, 0-5A and 0-10A employing individual shunt in each a D'Arsonval movement with an internal resistance of 500Ω and full scale deflection of 10mA is available. **(08 Marks)**

   c. What are the errors encountered in measurement process? Explain all with suitable example. **(05 Marks)**

OR

6 a. Design modified multirange voltmeter with basic D'Arsonval movement with an internal resistance of 50Ω and full scale deflection of 2mA, with voltage ranges of 0-10V, 0-50V, 0-100V and 0-250V. Draw the schematic diagram and show all values after design. **(07 Marks)**

   b. Explain the various static characteristics of measuring instruments. **(08 Marks)**

   c. With neat diagram, explain the operation of isolated flyback converter. **(05 Marks)**

Module-4

7 a. With neat block diagram, explain the operation of Ramp type Digital voltmeter. **(07 Marks)**

   b. Explain the operation of Time measurement with neat block diagram. **(08 Marks)**

   c. Draw the schematic diagram of Wheatstone's bridge and derive an expression for calculating unknown resistance and explain. **(05 Marks)**

OR

8 a. Explain the operation inductance comparision bridge with necessary equations. **(07 Marks)**

   b. Discuss the operation of successive approximation type DVM with necessary diagram. **(08 Marks)**

   c. An unbalanced Wheatstone bridge shown in Fig.Q.8(c), calculate the current through the galvanometer. **(05 Marks)**
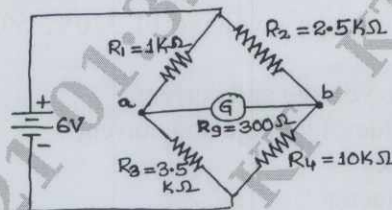
Fig.Q.8(c)

Module-5

9 a. Draw the schematic diagram to measure displacement using resistive transducer and explain. **(07 Marks)**

   b. Explain the operation of PLC with neat block diagram. **(05 Marks)**

   c. Explain the operation of Instrumentation amplifier using transducer bridge and derive equation for output voltage. **(08 Marks)**

OR

10 a. Explain the construction and working principle of LVDT with characteristic curve. **(07 Marks)**

   b. What are factors to be considered for selecting the transducer? **(08 Marks)**

   c. Illustrate working of analog weight scale. **(05 Marks)**

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18CPC39/49

USN ☐☐☐☐☐☐☐☐☐☐   Question Paper Version : **B**

Third/Fourth Semester B.E. Degree Examination, Jan./Feb. 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.

---

1. Chief Minister of a state is appointed by
    a) Governor   b) President
    c) High Command of a political party   d) Chief Justice of the High Court

2. Which one of the following is not a fundamental duty?
    a) Respect the National Flag and National Anthem
    b) Not to destroy public property
    c) Protection of environment and forest
    d) Parents or wards may not send their children to school

3. The constitution empowered State Government to make special law for the protection of
    a) Factory workmen   b) Unemployed youth
    c) Women and children   d) Farmers

4. Every citizen of India is eligible to vote in an election after attaining the age of
    a) 21 years   b) 16 years   c) 25 years   d) 18 years

5. Total number of articles and schedules in Indian Constitution are
    a) 397 Articles and 6 Schedules   b) 385 articles and 8 Schedules
    c) 440 Articles and 10 Schedules   d) 445 Articles and 12 Schedules

6. In engineering ethics, "tight coupling" means
    a) Strong adhesive material   b) Binding two beams tightly
    c) Process tightly coupled   d) Erecting two pillars side by side

7. Who is the Constitutional Head of the Nation?
    a) Chief Justice of India   b) President of India
    c) Prime Minister of India   d) Union External Affairs Minister

8. The resignation letter of President can be received and accepted by
   a) Chief Justice of India
   b) Vice-President of India
   c) Prime Minister of India
   d) Speaker of Loka Sabha

9. Who can administer the oath to the Chief Minister and Cabinet Minister of State Government?
   a) President of India
   b) Governor of State
   c) Chief Justice of High Court
   d) Advocate-General of State

10. The President can promulgate on ordinance only when
    a) The parliament is not in session
    b) There is a disagreement between the two houses of parliament
    c) The bill is in pending in the parliament for a year and above
    d) The Prime Minister recommends at anytime.

11. 'Fault Tree' method is used
    a) To assess the risk
    b) In engineering research
    c) To trace the fault of engineers
    d) to assess the accuracy of work

12. Under which law, a case is filed to recover damages when harm is caused from technology?
    a) Constitutional Law   b) Industrial Law   c) Law of Torts   d) Law of Crimes

13. Revealing confidential information amounts to
    a) Misusing the truth
    b) Breach of contract
    c) Using of Copyright without the permission owner
    d) Criminal breach of trust

14. The owner of the patent right retains his patent right for
    a) 50 years   b) 75 years   c) 20 years   d) 10 years

15. When a state emergency is declared, who can assume all the functions of State Government?
    a) Prime Minister
    b) President of India
    c) Governor of a State
    d) Union Cabinet

16. The Election Commission has no power to conduct the election to
    a) Parliament
    b) President
    c) Speaker of Loka Sabha
    d) State Legislature

17. Who can appoint Prime Minister of India?
    a) The people of India
    b) The President of India
    c) Ruling Legislative Party
    d) Election Commissioner

18. What is the maximum strength of Rajya Sabha?
    a) 224   b) 250   c) 288   d) 543

19. Vice-President of India is elected by the
    a) People of India
    b) Members of State Legislature
    c) Members of Rajya Sabha
    d) Members of both the houses of parliament

20. What is the minimum age to become the judges of the Supreme Court?
    a) 25 years   b) 30 years   c) 35 years   d) None of these

21. Who can certify the money bill immediately when it is introduced in the Loka Sabha?
    a) Speaker   b) Deputy Speaker   c) Finance Minister   d) Prime Minister

22. Under which Article the state has been directed to secure for the citizens a 'uniform civil code' in India?
    a) Art. 44   b) Art. 45   c) Art. 48   d) Art. 54

23. Which of the following refers to dishonesty in engineering ethics?
    a) Self-interest   b) Cooking   c) Self-deception   d) Fear

24. Who among the following is empowered to suspend or revoke the license to issue digital signature certificate granted to a certifying authority?
    a) Adjudicating Officer   b) Central Government
    c) Controller   d) Cyber Appellate Tribunal

25. Who can appoint the Presiding Officer of the cyber appellate tribunal?
    a) Central Government   b) State Government
    c) President   d) Chief Justice of India

26. Software Piracy means
    a) An attacker harasses a victim on line
    b) Sending huge volumes of e-mail by an abuser to target address
    c) Illegal copying, distribution, or use of software/computer
    d) any software used to disrupt computer or mobile operations

27. Gaining and unauthorized access to the data or information stored in a computer system is called:
    a) Malware   b) Hacking   c) Phishing   d) Web Jacking

28. What is a Mobile or SIM cloning?
    a) Thefting of information
    b) Someone obtains others personal information
    c) Copying the identity of one mobile telephone to another mobile telephone
    d) All of the above

29. One of the modes of regulation of internet is ....
    a) Customs   b) Norms   c) International Law   d) Native code

30. An important law relating to Indian cyber laws is
    a) Right to Information Act   b) Right to Education Act
    c) the Information Technology Act   d) E-Commerce Code

31. Which writ can be issued to quash the decision of lower courts?
    a) Habeaus corpus   b) Mandamus   c) Prohibition   d) Certiorari

32. The rights of citizens to take out processions or meeting is conferred by
    a) Right to form an association   b) Right to move anywhere in India
    c) Right to assembly   d) Right to carryon any trade

33. Which of the following word was added to the preamble of the constitution by the 42nd Amendment Act, 1976?
a) Secular   b) Republic   c) Sovereign   d) Democratic

34. Who can appoint the Chief Justice and other Judges of the Supreme Court?
a) Prime Minister   b) President   c) Law Minister   d) Vice-President

35. The doctrine of 'Rule of Law' is profounded by
a) Dr. A.V. Dicey   b) Dr. B.R. Ambedkar   c) Kelson   d) Bentham

36. What is the source of law in India?
a) Common law principles   b) Constitution of India
c) Supreme Court of India   d) Union Legislature (Parliament)

37. Who can be removed by the process of "impeachment"?
a) Prime Minister   b) Governor   c) District Judge   d) President

38. What is the basic attitude towards responsibility of engineer?
a) Absolute responsibility   b) Reasonable care
c) Personal safety   d) Strict guidelines

39. Which fund is utilized to meet the unforeseen expenditure?
a) Contingency Fund of India   b) Consolidated Fund of India
c) Public Revenue Fund   d) Political Party Fund

40. Attorney-General of India is appointed by
a) Prime Minister   b) Law Minister
c) President   d) Chief Justice of Supreme Court

41. The punishment for identity theft (making use of the electronic signature or password fraudulently) in India is …….
a) 6 years   b) 3 years   c) 10 years   d) 3 months

42. What is serious crime in Cyber Law which attracts a prison sentence for 20 years or more?
a) Fraud   b) Child pornography   c) Software Piracy   d) Hacking

43. One of the ways of misusing the truth is
a) Making the confused statement   b) Falsihood
c) Deliberate deception   d) Misrepresentation

44. One of the aims of engineering ethics is to
a) Acquire new skills in engineering
b) Stimulate to conduct research
c) Stimulate the moral imagination
d) Train to acquire self-confidence in their duties

45. Which of the provisions cannot be suspended during national emergency?
a) Arts. 14 and 15   b) Arts. 23 and 24   c) Arts. 20 and 21   d) Arts. 17 and 18

46. The constitution expressly permits the state to make special provisions for
a) Women and unemployed persons
b) Socially and educationally backward class people
c) Old, sick and disabled persons
d) Senior citizens

47. 'Creamy layer' means
    a) Highly educated persons
    b) Illiterate persons
    c) Highly cultured persons
    d) Persons having higher incomes

48. Under fundamental rights, <u>Minority</u> may be considered on the basis of
    a) Linguistic or religious
    b) Regional or national
    c) Racial or regional
    d) Caste or racial

49. The right against exploitation prohibits
    a) Labourers
    b) Mining employees sufferings
    c) Traffic in human beings
    d) None of these

50. The Supreme Court can issue the appropriate writ when there is a violation of …..
    a) Fundamental right
    b) Fundamental duties
    c) Directive principles
    d) None of these

51. Federal type of Government means
    a) Division of powers between Centre and State
    b) Distribution of powers between legislature and executive
    c) Separation of powers between President and Prime Minister
    d) None of the above

52. How much time taken to draft the Indian Constitution to adopt?
    a) 03 years 10 months 07 days
    b) 05 years 11 months 19 days
    c) 04 years 11 months 17 days
    d) 02 years 11 months 18 days

53. The seat of Supreme Court is in
    a) Bangaluru
    b) Delhi
    c) Mumbai
    d) Chennai

54. Which article recognized the international law under constitution?
    a) Art. 32
    b) Art. 42
    c) Art. 50
    d) Art. 51

55. Writ of 'Habeaus Corpus' means
    a) To command to do a duty
    b) To quash the decision
    c) To produce the person before the court
    d) On what authority?

56. The right to public appointment has been provided in
    a) Art. 14
    b) Art. 15
    c) Art. 16
    d) Art. 20

57. Reasonable restrictions can be imposed by the state under the provision of …….
    a) Art. 19(1)(a) to (g)
    b) Art. 19 (2) to (6)
    c) Art. 20 (a) to (c)
    d) Art. 21

58. An arrested person is to be allowed to …….
    a) Choose his own advocate
    b) Contact the political people
    c) Contact nearest magistrate
    d) Contact his relative

59. Any law made by the Parliament in contravention to the fundamental rights is declared as…….
    a) Valid
    b) Illegal
    c) Void
    d) Incorrect

60. Who are not entitled to form a Union or Association?
    a) Police
    b) Students
    c) Teachers
    d) Workmen of an industry

61. Indian Constitution is silent on the concept of
    a) Deputy Speaker of Loka Sabha   b) Deputy Prime Minister
    c) Deputy Chief Minister   d) Both (b) and (c)

62. Who is the Presiding Officer of the joint-session to discuss on the controversial bill of the parliament?
    a) President   b) Vice-President
    c) Speaker of Loka Sabha   d) Prime Minister

63. Who has the power to pardon the death sentence?
    a) President   b) Chief Justice of Supreme Court
    c) Governor of a State   d) Both (b) and (c)

64. Who can disqualify the MLAs, if they act against anti-defection law?
    a) Speaker of Loka Sabha   b) Speaker of Legislative Assembly
    c) Prime Minister   d) Chief Minister of a State

65. What is the term of member of Rajya Sabha?
    a) 5 years   b) 6 years   c) 4 years   d) 2 years

66. Which bill is to be introduced only in Loka Sabha?
    a) Ordinary bill   b) Money bill   c) Amendment bill   d) None of these

67. The protection, "No person is to be forced or compelled to say the witness against himself" is
    a) Ex-Post Facto Law   b) Double Zeo Pardy
    c) Self-Incrimination   d) Testimonial Compulsion

68. Phishing is
    a) a cyber crime   b) civil wrong   c) a net work   d) a type of computer

69. Child Pornography is
    a) Exposure of social behaviour of children
    b) Exploitation of children in the porn industry
    c) Not a cyber crime
    d) appreciable one

70. Which is the India's cybercrime capital?
    a) Bombay   b) Delhi   c) Bengaluru   d) Calcutta

71. The term of the selection commissioner is
    a) 3 years
    b) 4 years
    c) 6 years or till he attains the age of 65 years
    d) 5 years or till he attains the age of 62 years

72. Which one is not a kind of trade mark?
    a) Designs   b) Symbols   c) Sounds   d) Goodwill

73. Which is the very essential element in professional ethics?
    a) Honesty   b) Responsibility   c) Risk   d) Over-confidence

74. Who is the ex-officio-chairman of Rajya Sabha?
    a) President   b) Vice-President   c) Prime Minister   d) None of these

75. Which one of the following is not a fundamental right under Art. 21?
    a) Right to life   b) Right to dignity   c) Right to privacy   d) Right to suicide

76. If the Head of the State is an elected functionary for a fixed term, it is known as
    a) Unitary   b) Federal   c) Republic   d) Democratic

77. Which schedule gives details regarding the subjects included in the three lists – Central, State and Concurrent?
    a) Schedule - VII   b) Schedule - VIII   c) Schedule - V   d) Schedule - IV

78. 'Sovereign' means
    a) Independent Supreme Authority   b) Absolutism
    c) Dependent Authority   d) Dictatorship

79. A person can move to the Supreme Court directly for any violation of his Fundamental Right under Article ....
    a) 12   b) 22   c) 32   d) 226

80. Which one of the following is not included under the definition of state in Art.12?
    a) Parliament   b) Corporations   c) Executive   d) Judiciary

81. How many members are there in the election commission including its chairman?
    a) 5   b) 4   c) 3   d) 2

82. Who is empowered to proclaim the state emergency?
    a) Union President   b) Parliament   c) Governor of a state d) Prime Minister

83. Who is having the power to amend the provisions of the Constitution under Article 368?
    a) Parliament   b) President   c) Union cabinet   d) Supreme court

84. How many members are nominated to Rajyasabha by the President of India?
    a) Two   b) 20   c) 12   d) One

85. High Court Judge retires at the age of ....
    a) 65 years   b) 58 years   c) 60 years   d) 62 years

86. Who can appoint the Chief Justice of Supreme court of India?
    a) Prime Minister   b) Law Minister   c) President   d) Attorney-General

87. Money Bill will be introduced only in .....
    a) Cabinet   b) Loka Sabha   c) Rajya Sabha   d) Any one of these

88. "Equal Pay for Equal Work" for the men and women is included under
    a) Part-II Citizenship   b) Part-III : Fundamental Rights
    c) Part-IV DPSP   d) Part-V-A : Fundamental Duties

89. The right to freedom of press and publication are included in .....
    a) Right to personal liberty   b) Right to speech and expression
    c) Right to move anywhere in India   d) Right to trade

90. By which amendment, right to education made fundamental right and a new provision, Art.21-A was included in the constitution?
a) 44th Amendment   b) 76th Amendment   c) 86th Amendment   d) 91st Amendment

91. The fundamental rights guaranteed by the Constitution of India to its citizens can be protected by
a) Parliament   b) President
c) Supreme court   d) Union Home Minister

92. Which is the key to open the minds of the makers of the constitution?
a) Preamble   b) Parliament   c) Judiciary   d) Part – III (FRS)

93. Who was the Chairman and Chief Architect of the Indian Constitution?
a) Jawaharlal Nehru   b) Mahatma Gandhi
c) Dr. B.R. Ambedkar   d) Mount Batten

94. Which is the basis or test for the classification of people under Art.14?
a) Caste   b) Intelligible quotient
c) Intelligible differentia   d) Annual income

95. The Parliamentary system of Government of India is based on the pattern of
a) USA   b) UK   c) USSR   d) China

96. Which of the following is not a fundamental right?
a) Right to trade   b) Right to property
c) right to life   d) Right to form an association or union

97. The directive principles of state policy are
a) Enforceable by court   b) Not enforceable by court
c) Absolute principles   d) None of these

98. The practice of untouchability is prohibited under
a) Art.14   b) Art.15   c) Art.16   d) Art.17

99. Which of the ground replaced the internal disturbance by amendment in the year 1977?
a) War   b) External aggression
c) Armed rebellion   d) Terrorist activities

100. Which article has amended recently to remove the special status to the state of Jammu and Kashmir?
a) Art. 368   b) Art. 370   c) Art. 372   d) Art. 380

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USN ☐☐☐☐☐☐☐☐☐☐   **18MATDIP31**

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Additional Mathematics – I

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1. a. Prove that $(1+\cos\theta+i\sin\theta)^n + (1+\cos\theta-i\sin\theta)^n = 2^{n+1}\cos^n\left(\dfrac{\theta}{2}\right)\cos\left(\dfrac{n\theta}{2}\right)$. **(08 Marks)**

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

   c. Find the argument of $\dfrac{1+\sqrt{3}i}{1-\sqrt{3}i}$. **(06 Marks)**

OR

2. a. If $\vec{A}=4\hat{i}+3\hat{j}+\hat{k}$ and $\vec{B}=2\hat{i}-\hat{j}+2\hat{k}$ find a unit vector $\hat{N}$ perpendicular to both $\vec{A}$ and $\vec{B}$ such that $\vec{A}$, $\vec{B}$ and N from a right handed system. **(08 Marks)**

   b. If $\vec{a}=\hat{i}+2\hat{j}-3\hat{k}$ and $\vec{b}=3\hat{i}-\hat{j}+2\hat{k}$ then show that $(\vec{a}+\vec{b})$ and $(\vec{a}-\vec{b})$ are orthogonal. **(06 Marks)**

   c. Show that the position vectors of the vertices of a triangle $\vec{A}=3(\sqrt{3}\,\hat{i}-\hat{j})$, $\vec{B}=6\hat{i}$ and $C=3(\sqrt{3}i+j)$ form an isosceles triangle. **(06 Marks)**

Module-2

3. a. Obtain the Maclaurin series expansion of $\log\sec x$ upto to the terms containing x^6. **(08 Marks)**

   b. If $u=\tan^{-1}\left(\dfrac{x^3+y^3}{x-y}\right)$, prove that $xu_x+yu_y=\sin 2u$. **(06 Marks)**

   c. If $u=f(x-y, y-z, z-x)$, show that $u_x+u_y+u_z=0$. **(06 Marks)**

OR

4. a. Prove that $\log(1+x)=x-\dfrac{x^2}{2}+\dfrac{x^3}{3}-\dfrac{x^4}{4}...$ by using Maclaurin's series notation. **(08 Marks)**

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

   c. If $u=x+y, v=y+z, w=z+x$, find $J\left(\dfrac{u,v,w}{x,y,z}\right)$. **(06 Marks)**

Module-3

5. a. A particle moves along the curve $\vec{r}=\cos 2t\,\hat{i}+\sin 2t\,\hat{j}+t\,\hat{k}$, find the velocity and acceleration at $t=\dfrac{\pi}{8}$ along $\sqrt{2}\,\hat{i}+\sqrt{2}\,\hat{j}+\hat{k}$. **(08 Marks)**

   b. Find the unit normal to the surface, $xy+x+zx=3$ at $(1, 1, 1)$. **(06 Marks)**

   c. Find the constant 'a' such that the vector field $\vec{F}=2xy^2z^2\hat{i}+2x^2yz^2\hat{j}+ax^2y^2z\hat{k}$ is irrotational. **(06 Marks)**

OR

6 a. If $\vec{F} = (x + y + 1)\hat{i} + \hat{j} - (x + y)\hat{k}$ show that $\vec{F}.\text{curl}\vec{F} = 0$. **(08 Marks)**

b. If $\phi(x, y, z) = xy^2 + yz^3$, find $\nabla\phi$ & $|\nabla\phi|$ at $(1, -2, -1)$ **(06 Marks)**

c. Show that vector field $\vec{F} = \left[\dfrac{x\hat{i} + y\hat{j}}{x^2 + y^2} \right]$ is solenoidal. **(06 Marks)**

Module-4

7 a. Obtain a reduction for $\int_0^{\frac{\pi}{2}} \sin^n x\, dx$ $(n > 0)$. **(08 Marks)**

b. Evaluate $\int_0^1 \dfrac{x^9}{\sqrt{1 - x^2}} dx$. **(06 Marks)**

c. Evaluate $\iint_R xy\, dx\, dy$ where R is the first quadrant of the circle $x^2 + y^2 = a^2$, $x \geq 0$, $y \geq 0$. **(06 Marks)**

OR

8 a. Obtain a reduction formula for $\int_0^{\frac{\pi}{2}} \cos^n x\, dx$, $(n > 0)$. **(08 Marks)**

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

c. Evaluate $\int_{-1}^1 \int_0^z \int_{x-2}^{x+2} (x + y + z)\, dy\, dx\, dz$ **(06 Marks)**

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9 a. Solve $\dfrac{dy}{dx} + y \cot x = \sin x$. **(08 Marks)**

b. Solve $\cos x \sin y\, dx + \cos y \sin x\, dy = 0$. **(06 Marks)**

c. Solve $\dfrac{dy}{dx} + \dfrac{y}{x} = y^2 x$. **(06 Marks)**

OR

10 a. Solve : $\dfrac{dy}{dx} + \dfrac{y \cos x + \sin y + y}{\sin x + x \cos y + x} = 0$. **(08 Marks)**

b. Solve : $\dfrac{dy}{dx} + \dfrac{y}{x} = y^2 x$. **(06 Marks)**

c. Solve : $\sqrt{1 - y^2}\, dx = \left(\sin^{-1} y - x \right) dy$ **(06 Marks)**

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