CBCS SCHEME

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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:

   (i) $\left(\dfrac{4t+5}{e^{2t}}\right)^2$ (ii) $\left(\dfrac{\sin 2t}{\sqrt{t}}\right)^2$ (iii) $t\cos at$. **(10 Marks)**

   b. The square wave function f(t) with period 2a defined by $f(t) = \begin{cases} 1 & 0 \le t < a \\ -1 & a \le t < 2a \end{cases}$. Show that $\left(\dfrac{1}{s}\right)\tanh\left(\dfrac{as}{2}\right)$. **(05 Marks)**

   c. Employ Laplace transform to solve $\dfrac{d^2 y}{dt^2} - \dfrac{dy}{dt} = 0$, $y(0) = y_1(0) = 3$. **(05 Marks)**

OR

2 a. Find (i) $L^{-1}\left\{\dfrac{s^2 - 3s + 4}{s^3}\right\}$ (ii) $\cot^{-1}\left(\dfrac{s}{2}\right)$ (iii) $L^{-1}\left\{\dfrac{s}{(s+2)(s+3)}\right\}$ **(10 Marks)**

   b. Find the inverse Laplace transform of, $\dfrac{1}{s(s^2+1)}$ using convolution theorem. **(05 Marks)**

   c. Express $f(t) = \begin{cases} 2 & \text{if } 0 < t < 1 \\ \dfrac{t^2}{2} & \text{if } 1 < t < \dfrac{\pi}{2} \\ \cos t & t > \dfrac{\pi}{2} \end{cases}$ in terms of unit step function and hence find its Laplace transformation. **(05 Marks)**

Module-2

3 a. Obtain the Fourier series of $f(x) = \begin{cases} 2 & -2 < x < 0 \\ x & 0 < x < 2 \end{cases}$. **(08 Marks)**

   b. Find the half range cosine series of, $f(x) = (x+1)$ in the interval $0 \le x \le 1$. **(06 Marks)**

   c. Express $f(x) = x^2$ as a Fourier series of period 2π in the interval $0 < x < 2\pi$. **(06 Marks)**

OR

4 a. Compute the first two harmonics of the Fourier Series of f(x) given the following table :

x°	0	60°	120°	180°	240°	300°
y	7.9	7.2	3.6	0.5	0.9	6.8

(08 Marks)

b. Find the half range size series of e^x in the interval $0 \le x \le 1$. (06 Marks)

c. Obtain the Fourier series of $f(x) = \dfrac{\pi^2}{12} - \dfrac{x^2}{4}$ valid in the interval $(-\pi \quad \pi)$ (06 Marks)

Module-3

5 a. Find the Infinite Fourier transform of $e^{-|x|}$. (07 Marks)

b. Find the Fourier cosine transform of $f(x) = e^{-2x} + 4e^{-3x}$. (06 Marks)

c. Solve $u_{n+2} - 3u_{n+1} + 2u_n = 3^n$, given $u_0 = u_1 = 0$. (07 Marks)

OR

6 a. If $f(x) = \begin{cases} 1 & \text{for } |x| \le a \\ 0 & \text{for } |x| > a \end{cases}$, find the infinite transform of f(x) and hence evaluate $\displaystyle\int_0^\infty \dfrac{\sin x}{x} dx$.

(07 Marks)

b. Obtain the Z-transform of $\cosh n\theta$ and $\sinh n\theta$. (06 Marks)

c. Find the inverse Z-transform of $\dfrac{4z^2 - 2z}{z^3 - 5z^2 + 8z - 4}$ (07 Marks)

Module-4

7 a. Solve $\dfrac{dy}{dx} = e^x - y$, $y(0) = 2$ using Taylor's Series method upto 4th degree terms and find the value of $y(1.1)$. (07 Marks)

b. Use Runge-Kutta method of fourth order to solve $\dfrac{dy}{dx} + y = 2x$ at x = 1.1 given $y(1) = 3$ (Take h = 0.1) (06 Marks)

c. Apply Milne's predictor-corrector formulae to compute $y(0.4)$ given $\dfrac{dy}{dx} = 2e^x y$, with

(07 Marks)

x	0	0.1	0.2	0.3
y	2.4	2.473	3.129	4.059

OR

8 a. Given $\dfrac{dy}{dx} = x + \sin y$; $y(0) = 1$. Compute $y(0.4)$ with h = 0.2 using Euler's modified method. (07 Marks)

b. Apply Runge-Kutta fourth order method, to find y(0.1) with h = 0.1 given $\dfrac{dy}{dx} + y + xy^2 = 0$; $y(0) = 1$. (06 Marks)

c. Using Adams-Bashforth method, find y(4.4) given $5x\left(\dfrac{dy}{dx}\right) + y^2 = 2$ with

x	4	4.1	4.2	4.3
y	1	1.0049	1.0097	1.0143

(07 Marks)

Module-5

9 a. Solve by Runge Kutta method $\dfrac{d^2y}{dx^2} = x\left(\dfrac{dy}{dx}\right)^2 - y^2$ for x = 0.2 correct 4 decimal places, using initial conditions y(0) = 1, y'(0) = 0, h = 0.2. **(07 Marks)**

b. Derive Euler's equation in the standard form, $\dfrac{\partial f}{\partial y} - \dfrac{d}{dx}\left[\dfrac{\partial f}{\partial y'}\right] = 0.$ **(06 Marks)**

c. Find the extramal of the functional, $\displaystyle\int_{x_1}^{x_2} y^2 + (y')^2 + 2ye^x \, dx$. **(07 Marks)**

OR

10 a. Apply Milne's predictor corrector method to compute $\dfrac{d^2y}{dx^2} = 1 + \dfrac{dy}{dx}$ and the following table of initial values:

x	0	0.1	0.2	0.3
y	1	1.1103	1.2427	1.3990
y'	1	1.2103	1.4427	1.6990

(07 Marks)

b. Find the extramal for the functional, $\displaystyle\int_{0}^{\frac{\pi}{2}} [y^2 - y'^2 - 2y\sin x] \, dx$; y(0) = 0; $y\left(\dfrac{\pi}{2}\right) = 1$. **(06 Marks)**

c. Prove that geodesics of a plane surface are straight lines. **(07 Marks)**

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Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
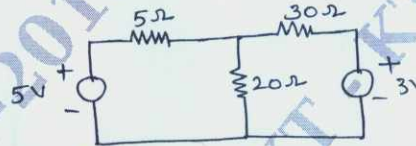## Network Theory

Time: 3 hrs.

Max. Marks: 100

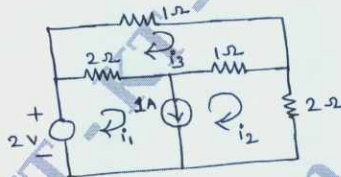*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Using source transformation technique find the current through 5Ω resistor for the circuit shown in Fig.Q.1(a) **(06 Marks)**
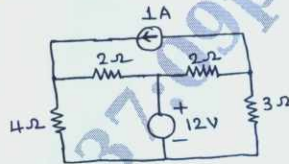
Fig.Q.1(a)

b. Use Mesh Analysis to determine the Mesh currents i_1, i_2 and i_3 for the network shown in Fig.Q.1(b). **(06 Marks)**

Fig.Q.1(b)

c. Find the power delivered by 1A current source using nodal analysis for the circuit shown in Fig.Q.1(c). **(08 Marks)**
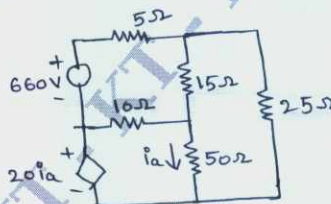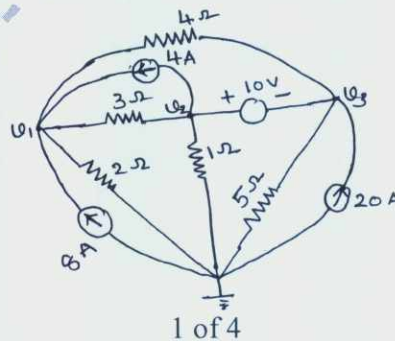
Fig.Q.1(c)

OR

2 a. Three Impedances are connected in delta, obtain the star equivalent of the network. **(06 Marks)**

b. Use Mesh Analysis to find the power delivered by the dependent voltage source in the circuit shown in Fig.Q.2(b). **(06 Marks)**

Fig.Q.2(b)

c. Determine all the node voltages for the circuit shown in Fig.Q.2(c) using nodal analysis. **(08 Marks)**

Fig.Q.2(c)

Module-2

3 a. State and explain superposition theorem **(06 Marks)**

b. Use Millman's Theorem to find the current flowing through $(2 + j3)\Omega$ impedance for the circuit shown in Fig.Q.3(b). **(08 Marks)**
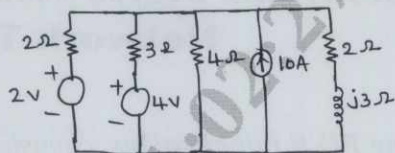
Fig.Q.3(b)

c. State and prove Norton's theorem. **(06 Marks)**

OR

4 a. Find the Thevenin's equivalent for the circuit shown in Fig.Q.4(a) with respect to terminals X-Y. **(08 Marks)**
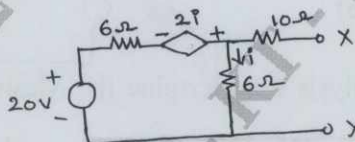
Fig.Q.4(a)

b. Find the condition for maximum power transfer in the AC circuit, where both R_L and X_L are varying. **(06 Marks)**

c. Determine the current through the load resistance using Norton's Theorem for the circuit shown in Fig.Q.4(c). **(06 Marks)**
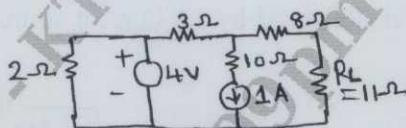
Fig.Q.4(c)

Module-3

5 a. Explain the behavior of R, L, C elements at the time of switching at t = 0, at $t = 0^+$ and $t = \infty$. **(07 Marks)**

b. In the network shown in Fig.Q.5(b). Find i, $\dfrac{di}{dt}$ and $\dfrac{d^2i}{dt^2}$ at $t = 0^+$. Assume that the capacitor is initially uncharged. **(07 Marks)**
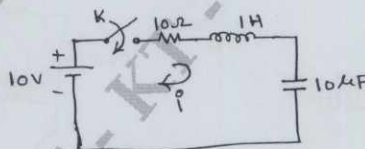
Fig.Q.5(b)

c. In the network shown in Fig.Q.5(c) find, i, $\dfrac{di}{dt}$ and $\dfrac{d^2i}{dt^2}$ at $t = 0^+$. The swich k is closed at t = 0 with zero current in the inductor. **(06 Marks)**
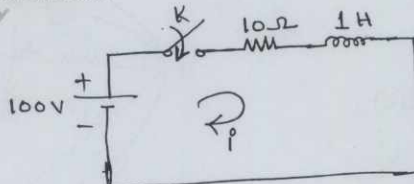
Fig.Q.5(c)

OR

6 a. In the network shown in Fig.Q.6(a). The switch k is changed from position a to b at t = 0, the steady state is reached at position a. Find i, $\dfrac{di}{dt}$ and $\dfrac{d^2i}{dt^2}$ at t = 0$^+$. Assume that the capacitor is initially uncharged. **(10 Marks)**
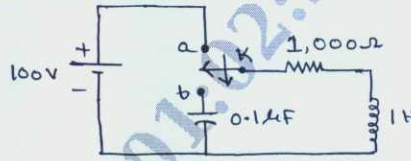
Fig.Q.6(a)

b. For the network shown in Fig.Q.6(b). The network is in steady state with switch k is closed. At t = 0, the switch is opened. Determine the voltage across the switch V_k and $\dfrac{d}{dt}V_k$ at t = 0$^+$. **(10 Marks)**
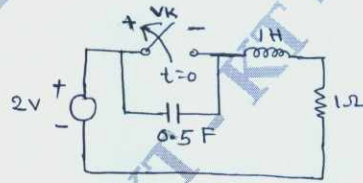
Fig.Q.6(b)

Module-4

7 a. Obtain Laplace transform of
   i) Step function
   ii) Ramp function
   iii) Impulse function. **(09 Marks)**
b. Find the Laplace transform of the periodic signal x(t) as shown in Fig.Q.7(b). **(11 Marks)**

Fig.Q.7(b)

OR

8 a. In the series RL circuit shown in Fig.Q.8(a), the source voltage is v(t) = 50 sin 250tV. Using Laplace transform determine, the current when switch K is closed at t = 0. **(10 Marks)**
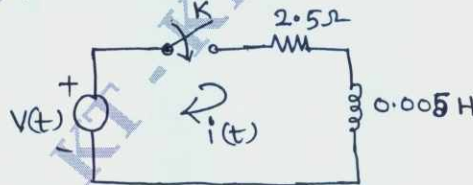
Fig.Q.8(a)

b. Find the Laplace transform of the non-sinusoidal periodic waveform shown in Fig.Q.8(b) **(10 Marks)**

Fig.Q.8(b)

3 of 4
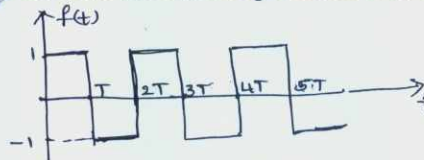
Module-5

9 a. Define Z parameters. Determine Z parameters interms of Y parameters. **(06 Marks)**

b. Determine h parameters of the circuit shown in Fig.Q.9(b) **(07 Marks)**
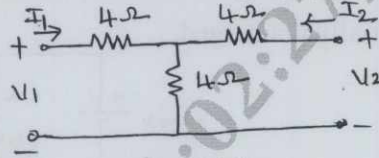
Fig.Q.9(b)

c. For the network shown in Fig.Q.9(c). Find the transmission parameters. **(07 Marks)**
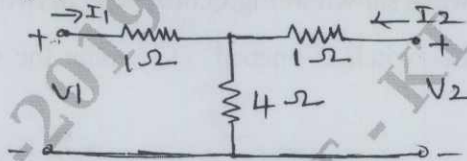
Fig.Q.9(c)

OR

10 a. Define Q-factor, selectivity and Band width. **(03 Marks)**

b. A series RLC circuit has a resistance of 10Ω, an inductance of 0.3H and a capacitance of $100\mu F$. The applied voltage is 230V. Find: i) The resonant frequency ii) lower and upper cut off frequencies iii) current at resonance iv) currents at f_1 and f_2 v) Voltage across. the inductance at resonance. **(07 Marks)**

c. Derive the expression for the resonant frequency of the circuit shown in Fig.Q.10(c). Also show that the circuit will resonate at all frequency if $R_L = R_C = \sqrt{\dfrac{L}{C}}$. **(10 Marks)**

Fig.Q.10(c)

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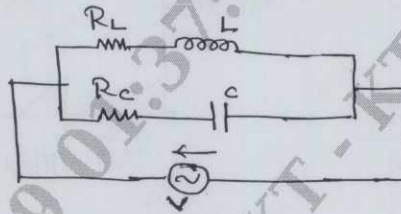
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Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Electronic Devices

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. What are the types of Bonding forceses in solids? Explain. **(06 Marks)**
   b. Explain the classification of material based on conductivity and energy band diagram. **(08 Marks)**
   c. Find the conductivity of the intrinsic germanium at 300 K. If a donar type impurity is added to the extent of 1 atom/10^7 germanium atom assume $\mu_n = 3800$, $\mu_P = 1800$, $n_i = 2.5 \times 10^3$, $Q = 1.602 \times 10^{-19}$. **(06 Marks)**

OR

2 a. What are Direct and Indirect band gap semiconductor? Explain with examples. **(08 Marks)**
   b. Explain the concentration of electron-hole pair in Intrinsic semiconductor with energy band diagram. **(06 Marks)**
   c. Calculate the Intrinsic carrier concentration in Silicon at room temperature $T = 300 \text{ K}$, where B is the material dependent parameter 5.4×10^{31} and E_G as the bandgap energy 1.12 eV, where K is the Boltzman constant $= 8.62 \times 10^{-5}$ eV/K. **(06 Marks)**

Module-2

3 a. With energy band diagram, explain the doping level in extrinsic semiconductor at 0 K and at 50 K. **(09 Marks)**
   b. What is the magnitude of HALL voltage in a N-Type germanium bar having an majority carrier concentration $N_D = 10^{17}$ cm³. Assume B = 0.2 Wb/m², d = 2 mm, E = 10 V/cm. **(05 Marks)**
   c. Explain the effect of temperature on semiconductor. **(06 Marks)**

OR

4 a. Explain the qualitative description of current flow at P-N junction under equilibrium and biased condition. **(08 Marks)**
   b. Explain zener breakdown and avalanche breakdown under reverse biased P-N junction. **(06 Marks)**
   c. Discuss the piece-wise linear approximations of junction diode under ideal condition. **(06 Marks)**

Module-3

5 a. Explain the optical generation of carrier in a P-N junction. **(08 Marks)**
   b. Discuss the configuration of a solar cell in enlarged view of the planar junction. **(06 Marks)**
   c. What is injection-electroluminiscence and what are its applications? **(06 Marks)**

OR

6   a. Explain I-V characteristics of n-p junction as a function of emitter current. **(08 Marks)**
    b. Discuss switching operation in common-emitter transistor. **(06 Marks)**
    c. Figure Q6 (c) shows the common emitter amplifier circuit. Calculate I_B and I_C assume $\tau_P = 10\,\mu s$, $\tau_t = 0.1\,\mu s$ **(06 Marks)**
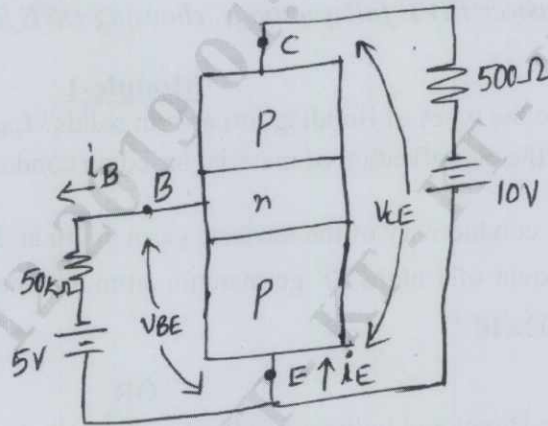
Fig. Q6 (c)

Module-4

7   a. Draw and explain the I-V characteristics of n-channel PNJFET for different biasing voltages. **(07 Marks)**
    b. Draw and explain the small signal equivalent circuit of n-channel PNJFET. **(07 Marks)**
    c. Explain the MOS structure with the aid of parallel-plate capacitor. **(06 Marks)**

OR

8   a. Explain the effect of frequency on gate voltage of a MOS capacitor with a P-type substrate. **(10 Marks)**
    b. Explain P-channel enhancement and depletion type MOSFET with their circuit symbols. **(10 Marks)**

Module-5

9   a. With schematic diagram, explain ION-implantation system. **(07 Marks)**
    b. Explain low pressure chemical vapour deposition reactor. **(07 Marks)**
    c. Discuss photolithography. **(06 Marks)**

OR

10 a. What are the different types of integrated circuits and its advantages? **(10 Marks)**
    b. Explain the process of Integration. **(10 Marks)**

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CBCS SCHEME

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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 combinational circuit to output the 2's complement of a 4-bit binary number. **(07 Marks)**

   b. Identify all prime implicants and essential prime implicants of following function using K-map:

$f(a, b, c, d) = \sum m + (6, 7, 9, 10, 13) + dc(1, 4, 5, 11, 15)$. Draw the diagram using NAND gates. **(07 Marks)**

   c. Expand the following in to canonical form and represent in decimal form:
     i) $f_1 = a + bc + ac'd$ in to min-terms
     ii) $f_2 = a(b +c) (a + c + d)$ into max terms. **(06 Marks)**

OR

2 a. Find the minimal sum of the following Boolean function using Quine-McClusky method:
$f(a, b, c, d) = \sum m (7, 9, 12, 13, 14, 15) + dc (4, 11)$. **(07 Marks)**

   b. Using K-map determine minimal product of sum expressions an implement the simplified equation using only NOR gates:
$f(w, x, y, z) = \pi(1, 2, 3, 4, 9, 10) + d(0, 14, 15)$. **(07 Marks)**

   c. Explain briefly K-map, Incompletely specified functions, essential prime implicants and Gray code. **(06 Marks)**

Module-2

3 a. Implement the following using 3 to 8 decoder with active low enable and active HIGH outputs:
     i) $f_1(a, b, c, d) = \sum m (0, 1, 5, 6, 7, 9, 10, 15)$
     ii) $f_2(a, b, c) = \pi(1, 3, 6, 7)$ **(06 Marks)**

   b. Explain 4-bit carry look-ahead adder with necessary diagram and relevant expressions. **(08 Marks)**

   c. Design 4 line to 2 line priority encoder which gives MSB the highest priority and LSB least priority. **(06 Marks)**

OR

4 a. Implement $f(a, b, c, d) = \sum(0, 4, 8, 10, 14, 15)$ using
     i)   8:1 MUX with a, b, c as select lines
     ii)   4:1 MUX with a, b as select lines. **(06 Marks)**

   b. Design a two bit magnitude comparator and draw the neat diagram. **(08 Marks)**

   c. Explain the structure of programmable logic arrays (PLA) with an example. **(06 Marks)**

Module-3

5 a. Explain clocked SR flip flop using NAND gates with necessary truth table and waveform. **(06 Marks)**

   b. Explain with a neat diagram and truth table, a 4-bit SIPO shift register to store binary number 1011. **(07 Marks)**

   c. What is race around condition? Explain JK master slave flip flop with a diagram, function table and timing diagram. **(07 Marks)**

OR

6 a. Explain with an excitation table, the conversion of SR flip flop in to JK and D flip flop.
(06 Marks)
   b. Explain the working of 4-bit Twisted Ring counter using necessary diagram and waveform.
(07 Marks)
   c. Explain the working of 3-bit Asynchronous up-down counter with necessary waveform and truth table.
(07 Marks)

Module-4

7 a. Design a self correcting synchronous counter using positive edge triggered JK flip flop to count 0, 1, 2, 4, 5, 6, 0, 1, 2…. Use the state table and state diagram.
(10 Marks)
   b. Design a clocked sequential circuit which operates according to the state diagram shown in Fig.Q.7(b). Implement the circuit using negative edge triggered JK flip-flop.
(10 Marks)

$a = 00$
$b = 01$
$c = 10$
$d = 11$
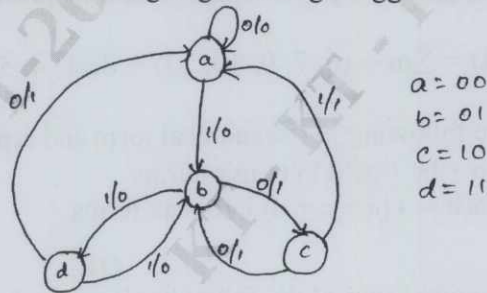
Fig.Q.7(b)

OR

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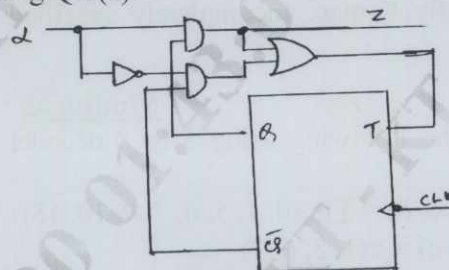
Fig.Q.8(a)

   b. Realize synchronous decade counter using T-flip-flop and draw the neat diagram.
(10 Marks)

Module-5

9 a. Design a Melay type sequence detector to detect the sequence of 101 in the given sequence of 001101100101011.
(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 with state table, state graph and transition table.
(10 Marks)
    b. Explain the design of sequential circuit using CPLDs and give CPLD implementation of a shift register and parallel adder with accumulator.
(10 Marks)

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CBCS SCHEME

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Computer Organization and Architecture

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a. With a neat diagram, explain basic operational concept of computer. **(10 Marks)**
    b. Explain in brief different types of key parameters that affect the processor performance. **(05 Marks)**
    c. Explain the Bus Structures. **(05 Marks)**

OR

2   a. Illustrate Instruction and Instruction sequencing with an example. **(10 Marks)**
    b. Define Byte Addressability, Big-endian and Little-endian assignment. **(06 Marks)**
    c. Represent 85.125 in IEEE floating point using single precision. **(04 Marks)**

Module-2

3   a. What is an addressing mode? Explain any five types of addressing modes with example. **(10 Marks)**
    b. Write a program to add 'n' number using indirect addressing mode. **(06 Marks)**
    c. Explain various assembler directives used in assembly language program. **(04 Marks)**

OR

4   a. Explain stack operation with an example **(10 Marks)**
    b. Explain subroutine linkage with an example using linkage register. **(06 Marks)**
    c. Explain the shift and rotate operations with example. **(04 Marks)**

Module-3

5   a. Showing the possible register configuration in I/O interface, explain program controlled input/output. **(10 Marks)**
    b. What is an interrupt? With an example illustrate the concept of interrupt. **(10 Marks)**

OR

6   a. Explain in detail, the situations where a number of devices capable of initiating interrupts are connected to processor. How to resolve the problems? **(10 Marks)**
    b. Explain the registers involved in a DMA interface, to illustrate DMA. **(06 Marks)**
    c. Explain the concept of Vectored Interrupt. **(04 Marks)**

Module-4

7   a. With figure, explain Internal Organization of 2M×8 dynamic memory chip. **(10 Marks)**
    b. Illustrate Internal structure of static memories. **(10 Marks)**

OR

8   a. With a neat diagram, explain virtual memory organization. **(10 Marks)**
    b. Briefly explain any four non-volatile memory concepts. **(05 Marks)**
    c. Briefly explain secondary storage devices. **(05 Marks)**

Module-5

9   a.   Explain the three-bus organization of the processor and its advantages.   (10 Marks)
    b.   Discuss the organization of hardwired control unit.   (05 Marks)
    c.   Discuss the control sequence for execution of instruction ADD(R_3), R_1 (05 Marks)

OR

10 a.   With a block diagram, describe the organization of a micro programmed control unit. (10 Marks)
    b.   Describe the sequence of control signals to be generated to fetch an instruction from memory in a single bus organization.   (10 Marks)

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Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Name the power semiconductor devices along their circuit symbols and maximum Ratings. **(04 Marks)**
    b. Explain the operation of SCR, interms of two transistor model and derive anode current and gate currents relation. Discuss how a small gate current can trigger the device into condition. **(08 Marks)**
    c. The latching current of a thyristor circuit is 60m Amp. The duration of the firing pulse is 50μsec. Given $V_s = 100V$, $R = 20\Omega$ and $L = 0.5H$ are connected in series.
       i) Derive the expression for circuit current i(t)
       ii) Draw variation of current i(t) with reference to time
       iii) Will the thyristor device gets turned ON? **(08 Marks)**

OR

2   a. Enumerate the applications of power electronics. **(04 Marks)**
    b. Explain the operation of self commutation by resonating load [class A] with relevant circuit and waveforms. **(08 Marks)**
    c. What are the gate triggering schemes? Explain with circuit diagram and wave forms, now RC triggering circuit turns ON (triggers) SCRs. **(08 Marks)**

Module-2

3   a. Explain the control strategies used to operate choppers. **(06 Marks)**
    b. Explain with the help of neat circuit diagram and waveforms, the operation of a single phase half wave controlled rectifiers with resistive load. Derive an expression for the :
       i) Average load voltage   ii) RMS load voltage. **(08 Marks)**
    c. For the ideal type A [step down] chopper circuit, following conditions are given : V = 220V, Duty cycle = 0.3, Chopping frequency f = 500Hz, R = 1Ω, L = 3mH and $E_b = 23$ volts. Determine the following :
       i)   Minimum value of output current (load)
       ii) Maximum value of output current (load)
       iii) Average output (load) current. **(06 Marks)**

OR

4   a. Explain the effect of free wheeling diode used in controlled rectifiers. **(04 Marks)**
    b. With the circuit diagram and circuit waveforms, explain the principle of operation of step-up chopper. **(08 Marks)**
    c. A single phase fully controlled bridge rectifier is feeding to a RL load, to obtain a regulated DC output voltage. The RMS value of the AC voltage is 230V, at 50Hz and the firing angle is maintained at π/3, so that the load current is 4Amp.
       i)   Calculate the DC average output voltage
       ii) Active power and reactive power input
       iii) Assuming the load resistance remains the same, determine DC average output voltage. If a freewheeling diode is used at output with all the conditions remains same. **(08 Marks)**

Module-3

5   a.   Define the terms : i) instrument ii) Accuracy iii) Absolute error iv) Relative errors?
                                                                                (04 Marks)
    b.   Explain the operation of single – phase half bridge inverter connected to RL load, with the help of circuit and waveforms.
                                                                                (08 Marks)
    c.   A basic D′ arsonval movement with a null scale deflection of 2mAmp and having an internal resistance of 50Ω is available. It is to be converted into a 0–10V, 0–1000V, 0–100V and 0–250V multi range voltmeter. Determine the value of resistance to extend?   **(08 Marks)**

OR

6   a.   What are inverters? Classify the inverters according to commutation and connections?
                                                                                (04 Marks)
    b.   What are the static errors? Explain them in detail with examples.   **(08 Marks)**
    c.   A single phase half bridge inverter, has resistive load of R = 3Ω and DC input voltage V_{dc} = 50 volts. Calculate :
         i)   RMS output voltage at fundamental frequency
         ii) The output power (P_0)
         iii) The average and peak current of each thyristor
         iv) The peak – reverse blocking voltage of each thyristor.   **(08 Marks)**

Module-4

7   a.   Explain how a simple AC bridge circuit operates and derive an expression for the unknown parameters.
                                                                                (04 Marks)
    b.   With the aid of diagram, explain the working of unbalanced wheat stone bridge and derive for a galvanometer current expression.
                                                                                (08 Marks)
    c.   Explain the principle of operation of digital time measurement with basic block diagram.
                                                                                (08 Marks)

OR

8   a.   What are the advantages of digital instruments over analog instruments?   **(04 Marks)**
    b.   Determine the equivalent parallel resistance and capacitance that causes a Wein's bridge to null condition with the following values : R_1 = 3.1KΩ, C_1 = 5.2μF, R_2= 55KΩ, R_4 = 100KΩ, ff = 2.5KHz. Derive the balanced expressions.
                                                                                (08 Marks)
    c.   With neat block diagram, explain the operating principle of a Ramp type DVM.   **(08 Marks)**

Module-5

9   a.   Define transducers. What are advantages of electrical transducers?   **(04 Marks)**
    b.   Explain instrumentation Amplifier using transducer bridge with the help of circuit diagram.
                                                                                (08 Marks)
    c.   Explain with neat diagram the PLC structure.   **(08 Marks)**

OR

10 a.   What are features of instrumentation Amplifiers? How it differs from the ordinary opAmp.
                                                                                (04 Marks)
    b.   Describe the operation of resistive position transducer with constructional diagram and typical circuit used.
                                                                                (08 Marks)
    c.   With the aid of Bridge circuit, explain the working of resistance thermometer. Mention limitations of it.
                                                                                (08 Marks)

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CBCS SCHEME

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| Question Paper Version : D |

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Constitution of India and 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. Which is the landmark Judgment passed by the Supreme Court in respect to Preamble of Constitution
    a) Beur beri
    b) Keshavananda Bharathi
    c) Menaka Gandhi
    d) Sonia Gandhi

2. Who is the neutral person in the affairs of party politics
    a) C.M
    b) Home Minister
    c) Finance Minister
    d) Speaker

3. Indian Constitution guarantees reservation of seats to SC & ST in
    a) Lok Sabha and Assembly
    b) Lok Sabha only
    c) Lok Sabha and Rajya Sabha
    d) Rajya Sabha

4. Who will preside over the joint session of both the houses of the Parliament
    a) President
    b) Prime Minister
    c) Speaker
    d) Law Minister

5. What is the minimum age for becoming M.P in Rajya Sabha and Lok Sabha
    a) 18 and 25
    b) 25 and 18
    c) 25 and 30
    d) 30 and 25

6. India is referred to as _____ under the Indian Constitution
    a) Country
    b) Hindustan
    c) India
    d) Bharat

7. The citizens can enforce their Fundamental Rights before SC under
    a) Article 31
    b) Article 32
    c) Article 33
    d) Article 34

8. Who quoted "Child of Today is Citizen of Tomorrow"?
   a) L. Tilak   b) Jawaharlal Nehru   c) B.R. Ambedkar   d) Gandhiji

9. What is the minimum age required for casting of Vote
   a) 18   b) 19   c) 20   d) 21

10. Who quoted "Freedom is my birth right"?
    a) L. Tilak   b) Jawaharlal Nehru   c) Sardar Patel   d) Gandhiji

11. One of the salient features of our constitution in
    a) It is fully rigid   b) It is fully flexible
    c) It is partly rigid and partly flexible   d) None of these

12. A person to be appointed as a Governor of a State must have completed the age of
    a) 30 years   b) 35 years   c) 45 years   d) 50 years

13. The Chief Election Commission holds office for a period of
    a) 3 years   b) 6 years
    c) 5 years   d) 6 years or till he attains age of 65 years

14. The procedure for amending the constitution is detailed under
    a) Article 360   b) Article 368   c) Article 352   d) Article 301

15. Writ of Mandamus can be issued on the ground of
    a) Non – performance of public duties   b) Unlawful Detention
    c) Unlawful occupation of public office   d) None of these

16. Who acted as the Chairman of the drafting committee of the Constitution of India?
    a) Dr. B.R. Ambedkar   b) B.C. Rajgopalanchari
    c) Dr. Rajendra Prasad   d) Jawaharlal Nehru

17. Engineering Ethics is
    a) A macro Ethics   b) Business Ethics
    c) A developing Ethics   d) A code of Scientific rules based on Ethics

18. The use of intellectual property of others without permission or credit is referred as
    a) Cooking   b) Stealing   c) Plagiarism   d) Trimming.

19. Who is the chair person of Parliament
    a) CM   b) PM   c) FM   d) Speaker

20. Who will impeach the Chief Justice of India
    a) Supreme Court   b) Law Minister
    c) 2/3rd Majority of Parliament   d) By Rajya Sabha

21. The Chief Justice of High – Court is appointed by
    a) President   b) Chief Minister   c) Prime Minister   d) Governor

22. Which is Not a Fundamental right
    a) Right to freedom   b) Right to Constitutional remedy
    c) Right to property   d) Right to equality

23. The tenure of Vice – President
   a) 2 years   b) 5 years   c) 3 years   d) 1 year

24. How many Schedules are there in Indian Constitution?
   a) 7   b) 5   c) 12   d) 6

25. The membership of Legislative Assembly of State varies between
   a) 60 & 500   b) 100 & 300   c) 150 & 450   d) 100 & 400

26. According to Indian Constitution, the power of amending the Constitution is vested with
   a) Parliament   b) President
   c) People   d) The Prime Minister of India

27. Engineers can use code of ethics as guidelines to
   a) Resolve the conflicts   b) Formulate the problem
   c) Shift of Responsibility   d) Overcome the work pressure

28. What is the maximum strength of Lok Sabha
   a) 500   b) 545   c) 552   d) 550

29. Union list has
   a) 95 subjects   b) 97 subjects   c) 105 subjects   d) 66 subjects

30. The Fundamental Rights of Indian citizen are contained in
   a) Part – III of Constitution   b) Part – IV of Constitution
   c) The 7th Schedule of Constitution   d) None of these

31. Uniform Civil code means
   a) A code related to individuals public life   b) A code meant for Hindu only
   c) A Civil procedure code
   d) A Codified Law applicable to all person of India irrespective of their religion

32. The Vice – President has power
   a) To sign bills passed by Rajya Sabha   b) To preside over Rajya Sabha
   c) To nominate two members for Rajya Sabha   d) To propagate ordinance

33. Parliament of India consists of
   a) Lok Sabha   b) Lok Sabha & Rajya Sabha
   c) Only Rajya Sabha   d) None of these

34. A National emergency can remain in operation with the approval of Parliament for
   a) An indefinite period   b) A maximum period of 6 months
   c) A maximum period of 1 year   d) A maximum period of 3 years

35. In Engineering research and testing, retaining the contradictory statement, discarding the rest is called
   a) Trimming   b) Scanning   c) Cooking   d) Skimming

36. The Chief Justice and other Judges of High Court are appointed by
   a) President   b) Chief Minister   c) Prime Minister   d) Governor

37. The terms 'Ethics' is derived from
    a) Ethical in English b) Ethic in Latin   c) Custom   d) Ethicos in Greek

38. The aim of the Directive Principles of State Policy is to establish
    a) Capitalist State in Our Country   b) Communist State in Our Country
    c) Welfare State in the Country   d) All of these

39. Special majority means more than
    a) 50% majority   b) Two – third majority c) 75% majority   d) 60 - majority

40. One way of misusing the truth is
    a) Exaggerating the truth   b) Making wrong statement
    c) Making confused statement   d) Failure to seek out the truth

41. Salaries and other emoluments of the High Court Judges shall be determined by the
    a) Governor   b) Parliament   c) Chief Minister   d) State Legislature

42. According to 74th Amendment Act of 1993, which subject has been incorporated?
    a) Municipalities   b) Co-operative Society
    c) Gram Panchayat   d) Taluk Panchayat

43. IP Sec is designed to withstand replay attacks through the use of
    a) Sequence numbers   b) Nonces
    c) Nonces + Sequence numbers   d) Timestamps

44. The Key Confirmation Key [KCK] is used to
    a) Integrity – protect data between the station and the AP
    b) Integrity – protect messages in the four – way hand shake
    c) Encrypt data between the station and the AP
    d) Encrypt the message containing the group key.

45. Which of the following is true in a Smurf Attack?
    a) The Victim receives large number of UDP packers to non – listening ports
    b) The Victim receives large number of TCP SYN – ACK packers
    c) The Victim receives large number of ICMP "Echo Request" messages
    d) The Victim receives large number of ICMP "Echo Reply" messages.

46. A persistent cross – site scripting attack saves malicious code on
    a) The client   b) The server   c) Both client & server d) Neither (a) & (b)

47. The possible goal of an attacker is sending packets with invalid combinations of TCP header flag is to
    a) Launch a SYN flood attack   b) Find which services are open
    c) Perform OS finger printing
    d) Determine the addressing schema within an organisation

48. The SOAP binding refers to
    a) The object bound to a SOAP message   b) The XML schema of a SOAP message
    c) The mapping between a SOAP message underlying transport protocol
    d) The headers in a SOAP message

49. The EKE protocol is resistant to
    a) Replay attacks
    b) Man – in – the middle attacks
    c) Dictionary attacks
    d) Reflection attacks

50. The SIM authenticates itself to the MSC/HLR using
    a) A user password
    b) A digital certificate
    c) A response to a challenge
    d) An encrypted signaling message.

51. When the Indian Constitution enacted and adopted?
    a) 26/10/1949   b) 26/12/1949   c) 26/11/1949   d) 26/01/1949

52. When the Indian Constitution gives effect
    a) 26/10/1949   b) 26/12/1949   c) 26/01/1950   d) 26/01/1949

53. Which of the following word was added in the Preamble of the Constitution by 42nd Amendment Act 1976
    a) Socialist   b) Sovereign   c) Federal   d) Republic

54. The President power to suspend death sentence temporarily is called
    a) Respite   b) Reprieve   c) Remission   d) Constitution

55. The Preamble of the Constitution has been amended so far
    a) 4 times   b) 3 times   c) twice   d) Once

56. Who are not entitled to form Union
    a) Students   b) Police   c) Teachers   d) Entrepreneurs

57. Which is not a Fundamental Right
    a) Right against exploitation
    b) Right to freedom of religion
    c) Right to strike
    d) Right to equality

58. Which of the following is not one of the 3 organs of state / Union
    a) Executive   b) Press   c) Judiciary   d) Legislation

59. How many Anglo Indians and others can be nominated by the President to the Lok Sabha and Rajyasabha
    a) 2 & 12   b) 2 & 10   c) 1 & 12   d) 1 & 10

60. Which state Constitution has removed by the Parliament of India?
    a) West Bengal   b) Nagaland   c) Sikkim   d) Jammu & Kashmir

61. When the office of the President falls vacant , the same must be filled up within
    a) 4 months   b) 6 months   c) 12 months   d) 18 months

62. The Preamble of the Constitution indicates
    a) Power to make laws
    b) The sovereign of Indian Constitution
    c) Power of Parliament to amend the Constitution
    d) Sources of Constitution.

63. Which important human right is protected under Article 21
   a) Right to Equality
   b) Right to life and liberty
   c) Right to freedom of speech
   d) Right to religion

64. Right to Equality is guaranteed under Article
   a) 13   b) 15   c) 16   d) 14

65. No person shall be punished for same offence more than once
   a) Jeopardy
   b) Double Jeopardy
   c) Ex-post facto law
   d) Testimonial compulsion

66. The Rajya Sabha
   a) Is a Permanent House
   b) Has a life of 6 years
   c) Has a life of 5 years
   d) Has a life of 7 years

67. The Quorum or minimum number of members required to hold the meetings of either houses of the Parliament is
   a) One - tenth   b) One - fifth   c) One - third   d) One - fourth

68. The Advice of Supreme Court is
   a) Binding on the President
   b) Not binding on the President
   c) Binding on the President if it is tendered unanimously
   d) None of these

69. Article 19 provides
   a) 6 freedoms   b) 7 freedoms   c) 8 freedoms   d) 5 freedoms

70. Who is the present speaker of Lok Sabha
   a) Sumithra Mahajan   b) K.S Hegde   c) Om Birla   d) Venkiah Naidu

71. Who appoints Lieutenant Governor General to Delhi
   a) PM   b) Law Minister   c) President   d) Vice - President

72. Who acts as a President when neither the President not the Vice – President is available
   a) Speaker of Lok Sabha
   b) Attorney General of India
   c) Chief Justice of India
   d) Speaker of Rajya Sabha

73. How many judges are there in the SC including Chief Justice of India?
   a) 15   b) 19   c) 25   d) 31

74. The Parliamentary system of the Indian Constitution is borrowed from
   a) Britain Constitution
   b) Objective Constitution
   c) Canada Constitution
   d) Australian Constitution

75. The final interpreter to the Indian Constitution is
   a) Speaker of LS   b) Parliament   c) President   d) Supreme Court

76. The person arrested has to be produced before Magistrate within
   a) 1 week   b) 24 hours   c) 72 hours   d) 2 months

77. Which is the language to be used in Parliament
    a) Kannada   b) Hindi   c) English   d) Both (b) & (c)

78. President made Proclamation of emergency on the grounds of internal disturbance for first time in
    a) 1975   b) 1965   c) 1962   d) 1950

79. Who will impeach Chief Election Commissioner of India
    a) President   b) Vice President
    c) Prime Minister   d) By 2/3rd majority of Parliament

80. Which is the highest Court of the Country
    a) High Court   b) Supreme Court   c) District Court   d) CET

81. India has
    a) Democracy   b) Presidental system
    c) Direct Democracy   d) Parliamentary Democracy

82. What is the punishment given , if computer source documents are tampared
    a) Imprisonment of 2 years with fine of Rs 2 lakhs
    b) Imprisonment of 3 years with fine of Rs 2 lakhs
    c) Imprisonment of 4 years with fine of Rs 2 lakhs
    d) Imprisonment of 5 years with fine of Rs 2 lakhs

83. What is the punishment given , if computer has been hacked under Section 43
    a) Imprisonment of 1 year with fine upto Rs 2 lakhs
    b) Imprisonment of 3 years with fine upto Rs 5 lakhs
    c) Imprisonment of 3 years with fine upto Rs 4 lakhs
    d) Imprisonment of 4 years with fine upto Rs 5 lakhs

84. Who appoints Prime Minister
    a) The President of India   b) Lok Sabha
    c) The majority party is Lok Sabha   d) Rajya Sabha

85. How much time was taken for framing Constitution?
    a) 2 years 11 months and 18 days   b) 13 years 11 months and 18 days
    c) 4 years 11 months and 18 days   d) 1 year 11 months and 18 days

86. The President of India is
    a) The real ruler of India   b) Head of the Government
    c) Constitution Head of Country   d) Head of the State

87. Which of the State has highest members in Lok Sabha
    a) Andra Pradesh   b) Uttar Pradesh   c) Madhya Pradesh   d) Karnataka

88. The Council of Ministers and Prime Minister shall not exceed total strength of the LokSabha
    a) 5 %   b) 10 %   c) 12 %   d) 15 %

89. The total number of seats in Legislative Assembly of Karnataka is
    a) 200   b) 224   c) 240   d) 250

90. The basic feature of the Indian Constitution is found in
    a) Fundamental duties
    b) Fundamental Rights
    c) Preamble
    d) Directive Principle of State Policy

91. To became a Judge of High Court, one must be practicing Advocate of High Court for a period of atleast _____ years
    a) 20
    b) 10
    c) 15
    d) 5

92. The Constitution empowers State Government to make Special Law for
    a) Workers
    b) Teachers
    c) Women & Children
    d) Farmers

93. Directive principles come under _____ of the Constitution
    a) Part - II
    b) Part - III
    c) Part - IV
    d) Part – I

94. The system of Legislature in the State of Karnataka is
    a) Bicameral
    b) Unicameral
    c) Cameral
    d) Multi cameral

95. The Mandal Commission, was Constituted relating to
    a) Reservation of SCs
    b) Reservation to STs
    c) Reservation
    d) Reservation to Backward classes

96. Who is appointing Chief Election Commissioner?
    a) Prime Minister
    b) Law Minister
    c) President
    d) Vice - President

97. Who is the Ex – Officio Chairman of Rajya Sabha?
    a) President
    b) Vice - President
    c) Prime Minister
    d) Governor

98. Vice – President of India is elected
    a) By the people
    b) By the members of State Legislature Assembly
    c) By the members of Rajya Sabha
    d) By the members of both the houses of Parliament at a joint sitting.

99. Which Amendment deals with the establishment of Municipalities a part of Constitution system?
    a) 44th
    b) 74th
    c) 76th
    d) 86th

100. Who appoints the Governor of the State?
    a) Chief Justice of India
    b) Chief Justice of State
    c) Chief Minister
    d) President

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USN ☐☐☐☐☐☐☐☐☐☐   18MATDIP31

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Express the following complex number in the form of $x + iy$: $\dfrac{(1+i)(1+3i)}{1+5i}$.   (06 Marks)

b. Prove that $\left(\dfrac{\cos\theta + i\sin\theta}{\sin\theta + i\cos\theta}\right)^4 = \cos 8\theta + i\sin 8\theta$.   (07 Marks)

c. If $\vec{a} = (3,-1,4)$, $\vec{b} = (1,2,3)$ and $\vec{c} = (4,2,-1)$, find $\vec{a} \times \left(\vec{b} \times \vec{c}\right)$.   (07 Marks)

OR

2   a. Find the angle between the vectors, $\vec{a} = 5\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} - 3\hat{j} + 6\hat{k}$.   (06 Marks)

b. Prove that $\left[\vec{a} \times \vec{b}, \vec{b} \times \vec{c}, \vec{c} \times \vec{a}\right] = \left[\vec{a}, \vec{b}, \vec{c}\right]^2$ (07 Marks)

c. Find the fourth roots of $-1 + i\sqrt{3}$ and represent them on the argand diagram.   (07 Marks)

Module-2

3   a. Obtain the Maclaurin's expansion of $\log_e(1+x)$.   (06 Marks)

b. If $u = \sin^{-1}\left[\dfrac{x^3 + y^3}{x + y}\right]$, prove that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} = 2\tan u$.   (07 Marks)

c. If $u = x(1-y)$, $v = xy$, find $\dfrac{\partial(u,v)}{\partial(x,y)}$.   (07 Marks)

OR

4   a. Obtain the Maclauvin's series expansion of the function $\log_e \sec x$.   (06 Marks)

b. If $u = x^2 - 2y$; $v = x + y$ find $\dfrac{\partial(u,v)}{\partial(x,y)}$.   (07 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)

Module-3

5   a. Find the velocity and acceleration of a particle moves along the curve, $\vec{r} = e^{-2t}\hat{i} + 2\cos 5t\hat{j} + 5\sin 2t\hat{k}$ at any time t.   (06 Marks)

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

c. Show that $\vec{F} = (2xy + z^2)\hat{i} + (x^2 + 2yz)\hat{j} + (y^2 + 2xz)\hat{k}$ is conservative force field and find the scalar potential.   (07 Marks)

OR

6 a. Show that the vector field, $\vec{F} = (3x + 3y + 4z)\hat{i} + (x - 2y + 3z)\hat{j} + (3x + 2y - z)\hat{k}$ is solenoidal.

(06 Marks)

b. Find the directional derivative of $\phi = \dfrac{xz}{x^2 + y^2}$ at $(1, -1, 1)$ in the direction of $\vec{A} = \hat{i} - 2\hat{j} + \hat{k}$.

(07 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.

(07 Marks)

Module-4

7 a. Find the reduction formula for $\displaystyle\int_0^{\frac{\pi}{2}} \sin^n x\, dx$.

(06 Marks)

b. Evaluate $\displaystyle\int_0^1\int_0^3 x^3 y^3\, dx\, dy$.

(07 Marks)

c. Evaluate $\displaystyle\int_0^3\int_0^2\int_0^1 (x + y + z)\, dz\, dx\, dy$.

(07 Marks)

OR

8 a. Evaluate : $\displaystyle\int_0^{\frac{\pi}{6}} \sin^6(3x)\, dx$.

(06 Marks)

b. Evaluate : $\displaystyle\int_0^1\int_x^{\sqrt{x}} xy\, dy\, dx$.

(07 Marks)

c. Evaluate : $\displaystyle\int_0^1\int_0^{1-x}\int_0^{1-x-y} xyz\, dz\, dy\, dx$.

(07 Marks)

Module-5

9 a. Solve : $\dfrac{dy}{dx} + y\cot x = \sin x$.

(06 Marks)

b. Solve : $(2x^3 - xy^2 - 2y + 3)dx - (x^2y + 2x)dy = 0$.

(07 Marks)

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

(07 Marks)

OR

10 a. Solve : $(5x^4 + 3x^2y^2 - 2xy^3)dx + (2x^3y - 3x^2y^2 - 5y^4)dy = 0$.

(06 Marks)

b. Solve : $\dfrac{dy}{dx} + x\sin 2y = x^3\cos^2 y$.

(07 Marks)

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

(07 Marks)

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