CBCS SCHEME

USN | | | | | | | | | | |

15MAT31

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Engineering Mathematics - III

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Obtain Fourier series expansion of $f(x) = |x|$ in the intercal $(-\pi, \pi)$ and hence deduce $\frac{\pi^2}{8} = \sum_1^{\infty} \frac{1}{(2n-1)^2}$. **(08 Marks)**

b. Obtain half range cosine series of
$$f(x) = \begin{cases} x, & 0 < x < \pi/2 \\ \pi - x, & \pi/2 < x < \pi \end{cases}.$$ **(08 Marks)**

OR

2 a. Obtain Fourier series expansion of $f(x) = \frac{\pi - x}{2},\ 0 \le x \le 2\pi$. **(06 Marks)**

b. Obtain half range sine series of $f(x) = x^2$ in the interval $(0, \pi)$. **(05 Marks)**

c. Obtain the Fourier series for the following function neglecting the terms higher than first harmonic. **(05 Marks)**

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

Module-2

3 a. Find the Fourier transform of $f(x) = \begin{cases} 1 - |x|, & |x| \le 1 \\ 0, & |x| > 1 \end{cases}$ and hence deduce $\int_0^{\infty} \frac{\sin^2 x}{x^2} dx = \pi/2$. **(06 Marks)**

b. Find the Fourier sine transform of $\frac{e^{-ax}}{x}$. **(05 Marks)**

c. Find the Inverse Z – transform of
$$\frac{8z^2}{(2z-1)(4z-1)}.$$ **(05 Marks)**

OR

4 a. Find the Fourier Cosine transform of
$$f(x) = \begin{cases} 4x, & 0 < x < 1 \\ 4 - x, & 1 < x < 4 \\ 0, & x > 4 \end{cases}.$$ **(05 Marks)**

b. Find the Z – transform of i) $\sinh n\theta$ ii) n^2. **(06 Marks)**

c. Solve the difference equation : $U_{n+2} - 5U_{n+1} + 6U_n = 2$, $U_0 = 3$, $U_1 = 7$. **(05 Marks)**

Module-3

5 a. Compute the coefficient of correlation and the equation of lines of regression for the data.

x	1	2	3	4	5	6	7
y	9	8	10	12	11	13	14

(06 Marks)

b. Fit a second degree parabola $y = ax^2 + bx + c$ for the following data :

x	0	1	2	3	4	5	6
y	14	18	27	29	36	40	46

(05 Marks)

c. Using Newton Raphson method, find a real root of $x \sin x + \cos x = 0$ near $x = \pi$, corrected to four decimal places. (05 Marks)

OR

6 a. Obtain the lines of regression and hence find coefficient of correlation for the following data

x	1	2	3	4	5
y	2	5	3	8	7

(06 Marks)

b. By the method of Least square, find a straight line that best fits the following data :

x	5	10	15	20	25
y	16	19	23	26	30

(05 Marks)

c. Using Regula – Falsi method to find a real root of $x \log_{10} x - 1.2 = 0$, carry out 3–iterations. (05 Marks)

Module-4

7 a. Find the interpolating formula f(x), satisfying f(0) = 0 , f(2) = 4 , f(4) = 56 , f(6) = 204 , f(8) = 496 , f(10) = 980 and hence find f(3). (06 Marks)

b. Use Newton's divided difference formula to find f(9), given

x	5	7	11	13	17
f(x)	150	392	1452	2366	5202

(05 Marks)

c. Evaluate $\int_0^1 \frac{x}{1+x^2} dx$ by applying Simpson's ⅜ th rule, taking 7 ordinates. (05 Marks)

OR

8 a. Using Newton's backward interpolation formula, find f(105), given

x	80	85	90	95	100
f(x)	5026	5674	6362	7088	7854

(06 Marks)

b. Apply Lagrange formula to find root of the equation f(x) = 0, given f(30) = -30 , f(34) = -13 , f(38) = 3 and f(42) = 18. (05 Marks)

c. Evaluate $\int_0^{0.3} \sqrt{1-8x^3}\, dx$, taking 6 – equal strips by applying Weddle's rule. (05 Marks)

Module-5

9 a. If $\vec{F} = (3x^2 + 6y)i - 14yzj + 20xz^2k$, evaluate $\int \vec{F}.d\vec{r}$ from (0, 0, 0) to (1, 1, 1) along the curve given by $x = t$, $y = t^2$, $z = t^3$. **(06 Marks)**

b. Find the extremal of the functional $\int_0^{\pi/2} (y^2 - y'^2 - 2y \sin x)dx$, $y(0) = y(\pi/2) = 0$. **(05 Marks)**

c. Prove that geodesics on a plane are straight lines. **(05 Marks)**

OR

10 a. Find the area between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ with the help of Green's theorem in a plane. **(06 Marks)**

b. Verify Stoke's theorem for $\vec{F} = yi + zj + xk$. Where S is the upper half of the sphere $x^2 + y^2 + z^2 = 1$ and C is it boundary. **(05 Marks)**

c. A heavy chain hangs freely under the gravity between two fixed points. Show that the shape of the chain is a Catenary. **(05 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | 15CS32

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Analog and Digital Electronics

Time: 3 hrs. Max. Marks: 80

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Explain the construction and working of JEFT. **(10 Marks)**
b. Explain the opamp window comparator circuit. **(06 Marks)**

OR

2 a. Explain the working of opamp Schmitt trigger. **(08 Marks)**
b. Explain 555 timer based Astable Multivibrator. **(08 Marks)**

Module-2

3 a. Define hazard. Explain static1 and static 0 hazard. **(06 Marks)**
b. Simplify the Boolean function using Quine-McClusky method:
$Y = F(A, B, C, D) = \Sigma m(2, 3, 7, 9, 11, 13) + d(1, 10, 15)$ **(10 Marks)**

OR

4 a. Write the verilog code for the logic circuit given in Fig.Q4(a) using structural and behavioral models.

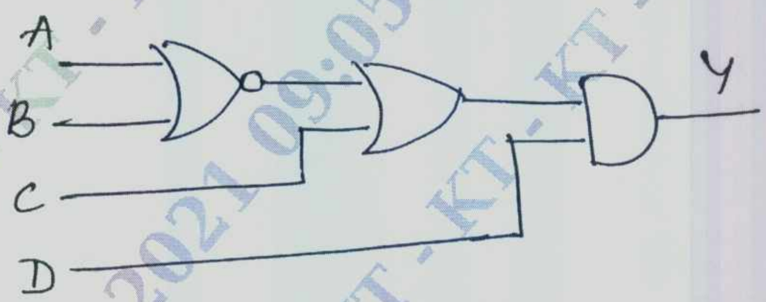

Fig.Q4(a) **(08 Marks)**

b. For the expression given below, use entered variable map technique and simplify the expression. Also draw the logic circuit using basic gates
$f(A, B, C, D) = Y = \Sigma m (1, 5, 10, 11, 12, 13)$ **(08 Marks)**

Module-3

5 a. Define a multiplexer. Analyze a 32:1 multiplexer using 4:1 multiplexers. Give detailed design and connections for the logic circuit. Use one 2:1 MUX. **(10 Marks)**
b. Explain the odd parity checker and generator circuit. **(06 Marks)**

OR

6 a. Implement 7-segment decoder using PLA. **(06 Marks)**
b. Explain n-bit Magnitude Comparator. **(06 Marks)**
c. Write verilog code to implement a 4:1 Multiplxer. **(04 Marks)**

Module-4

7 a. Explain with timing diagram, working of JK Master Slave flip flop. Also give the state transition diagram. (06 Marks)

b. Draw the logic diagram for a 4 bit serial-in-serial-out shift register using edge triggered J-K flip flop and explain the circuit with waveform and the truth table. (10 Marks)

OR

8 a. Mention two differences between asynchronous and synchronous counter. With a neat block diagram, timing diagram and truth table, explain a 3 bit binary ripple down counter using negative-edge triggered JK flip flop. (10 Marks)

b. Explain how a modulus 10 counter can be converted to modulus 8 counter using 7490 IC. (06 Marks)

Module-5

9 a. Write the verilog code to implement mod-8 up down counter. (06 Marks)

b. Explain the dual slope ADC circuit. (10 Marks)

OR

10 a. Explain binary ladder network type DAC. (08 Marks)

b. Explain the block diagram of digital clock constructed using counter cascading. (08 Marks)

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CBCS SCHEME

USN | | | | | | | | | | 15CS34

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

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Explain with a neat diagram, the different functional units of a digital computer. **(08 Marks)**

b. Explain the basic operational concepts between the processor and memory, with a neat diagram. **(08 Marks)**

OR

2 a. Explain the following : i) Byte addressability ii) Big – endian assignment iii) Little – endian assignment iv) Word alignment of a machine. **(08 Marks)**

b. Registers R_1 and R_2 of a computer contain the decimal value 1200 and 4600, what is the effective address of the source operand in each of the following instruction :
[R_1, R_2 and R_5 are registers]
Load 20(R_1) , R_5
Move # 3000, R_5
Store R_5, 30(R_1, R_2)
Add - (R_2), R_5. **(08 Marks)**

Module-2

3 a. What is Interrupt? With example, explain the concept of interrupts. **(08 Marks)**

b. What are the different methods of DMA transfer? Explain any one. **(08 Marks)**

OR

4 a. Why is bus arbitration required? Explain with block diagram, bus arbitration using Daisy – Chain. **(08 Marks)**

b. Explain Serial port and a Serial interface. **(08 Marks)**

Module-3

5 a. Define and explain the following : i) Memory access time ii) Memory cycle time iii) Random Access Memory (RAM) iv) Read Only Memory (ROM). **(08 Marks)**

b. Discuss the Internal organization of a 2M × 8 asynchronous DRAM chip. **(08 Marks)**

OR

6 a. Draw a neat block diagram of memory hierarchy in a contemporary computer system. Also indicate relative variation of size, speed and cost per bit, in the hierarchy. **(08 Marks)**

b. Explain Associative mapping technique and Set Associative mapping technique, with a neat diagram. **(08 Marks)**

Module-4

7 a. Design a 4 – bit binary adder / subtractor and explain its functions. **(08 Marks)**

b. Explain with diagram, Look – ahead Carry generator. **(08 Marks)**

OR

8 a. Perform Multiplication for (-13) and (+09) using Booth's Algorithm. (08 Marks)
b. Perform Multiplication of (+13) and (-6) using Bit Pair recoding method. (08 Marks)

Module-5

9 a. With a diagram, explain typical single bus processor data path. (08 Marks)
b. Write the control sequence for an unconditional branch instruction. (08 Marks)

OR

10 a. Explain the 3 – bus organization of the data path with a neat diagram and write the control sequence for the instruction ADD R_4, R_5, R_6 for the 3 – bus organization. (08 Marks)
b. Draw and explain typical hard wired control unit. (08 Marks)

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CBCS SCHEME

USN | | | | | | | | | | | **15MATDIP31**

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

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Find the real and imaginary parts of $\frac{2+i}{3-i}$ and express in the form of x + iy. **(05 Marks)**

b. Reduce $1 - \cos\alpha + j\sin\alpha$ to the modulus amplitude form $[r(\cos\theta + i\sin\theta)]$ by finding r and θ. **(06 Marks)**

c. If $\vec{a} = 4i + 3j + k$ and $\vec{b} = 2i - j + 2k$ find the unit vector perpendicular to both the vectors $\vec{a}$ and $\vec{b}$. Hence show that $\sin\theta = \frac{\sqrt{185}}{3\sqrt{26}}$ where 'θ' is angle between $\vec{a}$ and $\vec{b}$. **(05 Marks)**

OR

2 a. Find the modulus and amplitude of $\frac{3+i}{1+i}$. **(05 Marks)**

b. Find 'a' such that the vectors $2i - j + k$, $i + 2j - 3k$ and $3i + aj + 5k$ are coplanar. **(06 Marks)**

c. Show that for any three vectors $\bar{a}, \bar{b}, \bar{c}$ $[\bar{b}\times\bar{c}, \bar{c}\times\bar{a}, \bar{a}\times\bar{b}] = [\bar{a}, \bar{b}, \bar{c}]^2$. **(05 Marks)**

Module-2

3 a. Find the n^{th} derivative of sin (5x) cos (2x). **(05 Marks)**

b. If y = a cos (log x) + b sin (log x) prove that $x^2y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0$. **(06 Marks)**

c. If $u = \sin^{-1}\frac{x+y}{\sqrt{x}-\sqrt{y}}$ show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}\tan u$. **(05 Marks)**

OR

4 a. Expand $e^{\sin x}$ by Maclaurin's series upto the term containing x^4. **(05 Marks)**

b. Give $u - \sin\left(\frac{x}{y}\right)$ $x = e^t$ $y = t^2$ find $\frac{du}{dt}$ as a function of t. **(06 Marks)**

c. If $x = r\cos\theta$, $y = r\sin\theta$ find $\frac{\partial(x,y)}{\partial(r,\theta)}$ and $\frac{\partial(r,\theta)}{\partial(x,y)}$. **(05 Marks)**

Module-3

5 a. State reduction formula for $\int_0^{\pi/2}\sin^n x\,dx$ and evaluate $\int_0^{\pi/2}\sin^9 x\,dx$. **(05 Marks)**

b. Evaluate $\int_0^\infty \frac{dx}{(1+x^2)^{7/2}}$. **(06 Marks)**

c. Evaluate : $\int_0^1\int_0^2\int_0^2 x^2yz\,dx\,dy\,dz$. **(05 Marks)**

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OR

6 a. Evaluate : $\int_0^{\pi} \sin^4 x \cos^6 x \, dx$. **(05 Marks)**

b. Evaluate : $\int_0^5 \int_0^{x^2} y(x^2 + y^2) dx \, dy$. **(06 Marks)**

c. Evaluate : $\int_0^1 \int_0^2 \int_1^2 x^3 y^2 z^3 \, dx \, dy \, dz$. **(05 Marks)**

Module-4

7 a. A particle moves along the curve $x = t^3 + 1$, $y = t^2$, $z = 2t + 3$ where t is the time. Find the velocity and acceleration at time $t = 1$. **(05 Marks)**

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

c. What is solenoid vector field? Demonstrate that vector $\overline{F}$ given by $\overline{F} = 3y^2z^3 i + 8x^2 \sin(z) j + (x + y)k$ is solenoidal. **(05 Marks)**

OR

8 a. Find div F and Curl F if $\overline{F} = (3x^2 - 3yz)i + (3y^2 - 3xz)j + (3z^2 - 3xy)k$. **(05 Marks)**

b. Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at the point $(2, -1, 2)$. **(06 Marks)**

c. Show that the fluid motion $\vec{V} = (y + z)i + (z + x)j + (x + y)k$ is irrotational. **(05 Marks)**

Module-5

9 Find the solution of :

a. $(x^2 + 2e^x)dx + (\cos y - y^2)dy = 0$. **(05 Marks)**

b. $\frac{dy}{dx} = \frac{y/x}{1 + y/x}$. **(06 Marks)**

c. $(x^2 - ay)dx + (y^2 - ax)dy = 0$. **(05 Marks)**

OR

10 a. Find the solution of :

$\frac{dy}{dx} = \frac{x^3}{y^3}$. **(05 Marks)**

b. $(x^2y^3 + \sin x)dx + (x^3y^2 + \cos y)dy = 0$. **(06 Marks)**

c. $\cos y \frac{dy}{dx} + \sin y = 1$. **(06Marks)**

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