

CBCS SCHEME

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15MAT31

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 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 the Fourier expansion of the function $f(x) = x$ over the interval $(-\pi, \pi)$. Deduce that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots$ (08 Marks)
- b. The following table gives the variations of a periodic current A over a certain period T:

t (sec)	0	T/6	T/3	T/2	2T/3	5T/6	T
A (amp)	1.98	1.30	1.05	1.30	-0.88	-0.25	1.98

Show that there is a direct current part of 0.75amp in the variable current and obtain the amplitude of the first harmonic. (08 Marks)

OR

- 2 a. Obtain the Fourier series for the function $f(x) = 2x - x^2$ in $0 \leq x \leq 2$. (06 Marks)

b. Represent the function

$$f(x) = \begin{cases} x, & \text{for } 0 < x < \pi/2 \\ \pi/2 & \text{for } \pi/2 < x < \pi \end{cases}$$

in a half range Fourier sine series. (05 Marks)

- c. Determine the constant term and the first cosine and sine terms of the Fourier series expansion of y from the following data:

x°	0	45	90	135	180	225	270	315
y	2	3/2	1	1/2	0	1/2	1	3/2

(05 Marks)

Module-2

- 3 a. Find the complex Fourier transform of the function

$$f(x) = \begin{cases} 1 & \text{for } |x| \leq a \\ 0 & \text{for } |x| > a \end{cases} \quad \text{Hence evaluate } \int_0^{\infty} \frac{\sin x}{x} dx.$$

(06 Marks)

- b. If $\bar{u}(z) = \frac{2z^2 + 3z + 12}{(z-1)^4}$ show that $u_0 = 0$ $u_1 = 0$ $u_2 = 2$ $u_3 = 11$. (05 Marks)

- c. Obtain the Fourier cosine transform of the function

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

(05 Marks)

OR

- 4 a. Obtain the Z-transform of $\cos n\theta$ and $\sin n\theta$. (06 Marks)
- b. Find the Fourier sine transform of $f(x) = e^{-|x|}$ and hence evaluate $\int_0^{\infty} \frac{x \sin mx}{1+x^2} dx$ $m > 0$. (05 Marks)
- c. Solve by using Z-transforms $y_{n+2} + 2y_{n+1} + y_n = n$ with $y_0 = 0 = y_1$. (05 Marks)

Module-3

- 5 a. Fit a second degree parabola $y = ax^2 + bx + c$ in the least square sense for the following data and hence estimate y at $x = 6$. (06 Marks)

x	1	2	3	4	5
y	10	12	13	16	19

- b. Obtain the lines of regression and hence find the coefficient of correlation for the data:

x	1	3	4	2	5	8	9	10	13	15
y	8	6	10	8	12	16	16	10	32	32

- c. Use Newton-Raphson method to find a real root of $x \sin x + \cos x = 0$ near $x = \pi$. Carry out the iterations upto four decimal places of accuracy. (05 Marks)

OR

- 6 a. Show that a real root of the equation $\tan x + \tanh x = 0$ lies between 2 and 3. Then apply the Regula Falsi method to find third approximation. (06 Marks)
- b. Compute the coefficient of correlation and the equation of the lines of regression for the data:

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

- c. Fit a curve of the form $y = ae^{bx}$ for the data:

x	0	2	4
y	8.12	10	31.82

- 7 a. From the following table find the number of students who have obtained:
- Less than 45 marks
 - Between 40 and 45 marks.

Marks	30-40	40-50	50-60	60-70	70-80
Number of students	31	42	51	35	31

- b. Construct the interpolating polynomial for the data given below using Newton's general interpolation formula for divided differences and hence find y at $x = 3$.

x	2	4	5	6	8	10
y	10	96	196	350	868	1746

- c. Evaluate $\int_0^1 \frac{x}{1+x^2} dx$ by Weddle's rule. Taking seven ordinates. Hence find $\log_e 2$. (05 Marks)

OR

- 8 a. Use Lagrange's interpolation formula to find $f(4)$ given below. (06 Marks)

x	0	2	3	6
f(x)	-4	2	14	158

- b. Use Simpson's $3/8^{\text{th}}$ rule to evaluate $\int_1^4 e^{1/x} dx$. (05 Marks)

- c. The area of a circle (A) corresponding to diameter (D) is given by

D	80	85	90	95	100
A	5026	5674	6362	7088	7854

Find the area corresponding to diameter 105 using an appropriate interpolation formula.

(05 Marks)

Module-5

- 9 a. Evaluate Green's theorem for $\oint_c (xy + y^2) dx + x^2 dy$ where c is the closed curve of the region bounded by $y = x$ and $y = x^2$. (06 Marks)
- b. Find the extremal of the functional $\int_a^b (x^2 + y^2 + 2y^2 + 2xy) dx$. (05 Marks)
- c. Verify Stoke's theorem for $\vec{F} = (2x - y)\hat{i} - yz^2\hat{j} - y^2z\hat{k}$ where S is the upper half surface of the sphere $x^2 + y^2 + z^2 = 1$ C is its boundary. (05 Marks)

OR

- 10 a. Derive Euler's equation in the standard form $\frac{\partial f}{\partial y} - \frac{d}{dx} \left(\frac{\partial f}{\partial y_1} \right) = 0$. (06 Marks)
- b. If $\vec{F} = 2xy\hat{i} + y^2z\hat{j} + xz\hat{k}$ and S is the rectangular parallelepiped bounded by $x = 0, y = 0, z = 0, x = 2, y = 1, z = 3$. Evaluate $\iint_S \vec{F} \cdot \hat{n} ds$. (05 Marks)
- c. Prove that the shortest distance between two points in a plane is along the straight line joining them or prove that the geodesics on a plane are straight lines. (05 Marks)

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15CS32

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 Analog and Digital Electronics

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. Explain the construction and principles of operation of JFET. (08 Marks)
 b. Explain with neat sketches, the operation and parameter of n-channel depletion type MOSFET. (08 Marks)

OR

- 2 a. Discuss characteristics of an ideal op-amp and compare with practical op-amp. (08 Marks)
 b. For the circuit shown in Fig.Q2(b) determine the value of drain source voltage (V_{DS}). Assume $V_{GS} = -0.8V$.

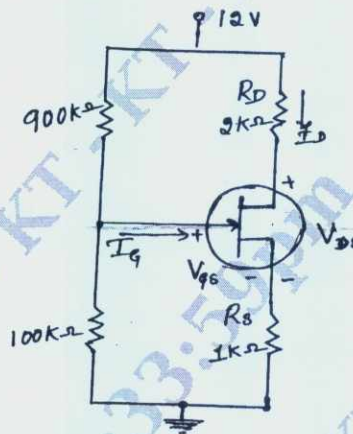


Fig.Q2(b)

(08 Marks)

Module-2

- 3 a. What are universal gates? Draw the logic circuit for $y = (A + B + C)(A + B + C)$ using universal gates. (05 Marks)
 b. Find the minimal SOP of the following Boolean function using K-Map.
 $F(a, b, c, d) = \sum m(7, 9, 10, 11, 12, 13, 14, 15)$ (05 Marks)
 c. Define Hazards? How to design a static 1 hazard free circuit? Explain with an example. (06 Marks)

OR

- 4 a. Simplify the expression $y = f(A, B, C, D) = \sum m(1, 2, 8, 9, 10, 12, 13, 14)$ using Quine – McClusky Method. (10 Marks)
 b. What is the need of HDL? Write the verilog code for the circuit. Shown in Fig.Q4(b)

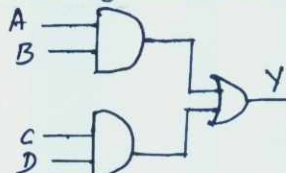


Fig.Q4(b)

(06 Marks)

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-3

- 5 a. What is multiplexer? Write the logic circuit and truth table of 4:1 multiplexer. (05 Marks)
 b. Explain BCD to Decimal decoder along with circuit diagram. (05 Marks)
 c. What is magnitude comparator? Design and explain 1 bit magnitude comparator. (06 Marks)

OR

- 6 a. Implement the following function using PLA
 $A(x, y, z) = \sum m(1, 2, 4, 6)$
 $B(x, y, z) = \sum m(0, 1, 6, 7)$
 $C(x, y, z) = \sum m(2, 6)$ (06 Marks)
 b. Implement the Boolean function expressed by
 SOP $f(a, b, c, d) = \sum m(1, 3, 4, 5, 9, 11, 12)$ using 8:1 MUX. (06 Marks)
 c. Write a note on parity Checker. (04 Marks)

Module-4

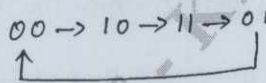
- 7 a. What is flip flop? Explain the working of JK master slave flip flop using NAND gates. (08 Marks)
 b. Write the Execution table of SR, D, JK and T flip flop. (04 Marks)
 c. Write the difference between synchronous and Asynchronous counter. (04 Marks)

OR

- 8 a. Using Positive edge triggered D flip flop, draw the logic diagram of 4bit SISO Register. Draw the timing diagram to shift binary number 1110 into Register. (05 Marks)
 b. Explain with neat diagram 4 bit switched tail counter (05 Marks)
 c. Explain how shift Register can be applied for sequence detector. (06 Marks)

Module-5

- 9 a. Explain a 3 bit binary Rippeddown counter. Give block diagram, truth table and output waveforms. (08 Marks)
 b. Design a sequences, a module – 4 Irregular counter with following counting sequence using D flip flop. (08 Marks)

**OR**

- 10 a. Explain 4 bit D/A converter. (10 Marks)
 b. What is binary ladder? Explain the binary ladder with digital input of 1000. (06 Marks)

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15CS33

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 Data Structures and Applications

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. What do you mean by dynamic memory allocation? List and explain various functions supported by C to carryout dynamic memory allocation. (09 Marks)
- b. What is sparse matrix? Show with a suitable example sparse matrix representation starting as triplets. (03 Marks)
- c. Write simple transfer algorithm to transpose the given sparse matrix. (04 Marks)

OR

- 2 a. Write the Knuth Morris Pratt pattern matching algorithm and apply the same to search the pattern 'abcdabey' in the text 'abxabcdbabxabcdbabedabey' (08 Marks)
- b. Consider two polynomials $A(x) = 4x^{15} + 3x^4 + 5$ and $B(x) = x^4 + 10x^2 + 1$. Show diagrammatically how these polynomials can be stored in a 1-D array. Also give its C representation. (03 Marks)
- c. What is data structure? List and explain different operation performed on data structure. (05 Marks)

Module-2

- 3 a. List the disadvantages of linear queue and explain how it is solved in circular queue. Implement circular queue with supporting functions using array. (08 Marks)
- b. Convert the following infix expression into postfix expression:
 - i) $(a + b) * d + e / (f + a * d) + c$
 - ii) $((a / (b - c + d)) * (e - a) * c)$(04 Marks)
- c. What is recursion? Write recursive function to solve tower of Hanoi problem. (04 Marks)

OR

- 4 a. Define stack. Implement push and pop functions for stack using arrays with stackfull and stackempty conditions. (08 Marks)
- b. Convert the following infix expression to postfix expression using stack.
 $((a / b) - c) + (d * e) - (a * c)$ (08 Marks)

Module-3

- 5 a. Give the node structure to create singly linked list of integer and write function to perform.
 - i) Create list
 - ii) Insert node at the end
 - iii) Delete first node
 - iv) Display all nodes.(08 Marks)
- b. What are the disadvantages of doubly linked list over singly linked list? Illustrate with example. Write node structure of doubly linked list. (08 Marks)

OR

- 6 a. Write a C program to implement linked stack? (08 Marks)
 b. Write node structure for linked representation of polynomial. Explain algorithm to add two polynomial represented using linked lists. (08 Marks)

Module-4

- 7 a. What is a tree? Explain with suitable example: i) Binary tree ii) Skewed binary tree iii) Complete binary tree. (07 Marks)
 b. Draw a binary tree for the following expression $3 + 4 * (7 - 6) / 4 + 3$. Traverse the generated tree using inorder, preorder and postorder. Also write functions for each traversal. (09 Marks)

OR

- 8 a. For a given data, draw a binary search tree and show the array and linked representation of the same 100, 85, 45, 55, 110, 20, 70, 65. (08 Marks)
 b. What is binary search tree? Write an algorithm to search given element in a binary search tree. (08 Marks)

Module-5

- 9 a. What is collision? What are the methods to resolve collision? Explain linear probing with an example. (08 Marks)
 b. What are the methods used for traversing a graph? Explain any one with example. (08 Marks)

OR

- 10 a. Define graph. Differentiate between tree and graph. (03 Marks)
 b. For the given graph, show adjacency matrix and adjacency list representation. (Ref.Fig.Q.10(b)). (05 Marks)

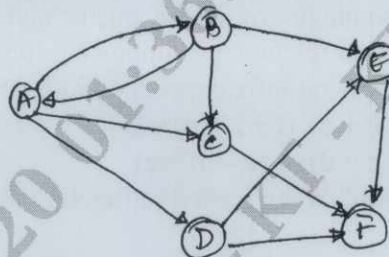


Fig.Q.10(b)

- c. Briefly explain basic operations that can be performed on a file. Explain indexed sequential file organization. (08 Marks)

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15CS34

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 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. With a neat diagram, explain the connection between processor and memory. (08 Marks)
b. Explain: (i) Processor clock (ii) Clock rate (08 Marks)
(iii) Basic performance equation (iv) Performance measurement (08 Marks)

OR

- 2 a. List the addressing modes with assemble syntax and addressing functions. (08 Marks)
b. Explain basic input output operation. Write a program to read a line of character and display it. (08 Marks)

Module-2

- 3 a. Explain the interrupts with hardware. Write the steps in enabling and disabling interrupts. (08 Marks)
b. Explain the issues in handling the multiple devices in interrupts. (08 Marks)

OR

- 4 a. With a neat diagram, explain DMA and different types of bus arbitrations. (08 Marks)
b. Explain USB tree structure and protocols. (08 Marks)

Module-3

- 5 a. Draw the internal organization of a $2M \times 8$ dynamic memory chip. Explain fast page mode. (08 Marks)
b. Explain the mapping functions used in cache memory. (08 Marks)

OR

- 6 a. What is memory interleaving? Explain with example. (08 Marks)
b. What is virtual memory? Explain the address translation. (08 Marks)

Module-4

- 7 a. Design 4-bit carry look ahead adder and explain. (08 Marks)
b. Explain Booth recoding of a multiplier. Perform $(+13) \times (-6)$ using Booths algorithm. (08 Marks)

OR

- 8 a. Explain logic and circuit arrangement for implementing restoring division. (08 Marks)
b. Write the rules for arithmetic operations on floating point operations. (08 Marks)

Module-5

- 9 a. With a neat diagram, explain single bus organization of data path inside the processor. (08 Marks)
b. Write actions required and control sequence for execution of instruction ADD (R_3), R_1 . (08 Marks)

OR

- 10 a. Briefly explain the block diagram of microwave oven. (08 Marks)
b. Explain the different possible ways of implementing a multiprocessor system. (08 Marks)

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15CS35

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 Unix and Shell Programming

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. Describe the salient features of UNIX Operating System. (07 Marks)
b. Write the general structure for command usage in UNIX. (03 Marks)
c. Explain in detail the commands needed for user management. (06 Marks)

OR

- 2 a. Compare and contrast External and Internal commands. (04 Marks)
b. Mention the use of following commands:
(i) script
(ii) cat
(iii) who
(iv) pwd
(v) ls
(iv) cal (12 Marks)

Module-2

- 3 a. Elaborate on absolute and relative pathnames with suitable example. (04 Marks)
b. With a neat diagram explain the UNIX file system organization that explains parent child relationship. (09 Marks)
c. Describe the /etc/shadow folder in UNIX file system. (03 Marks)

OR

- 4 a. Demonstrate the usage of any five commands related to files and directories. (10 Marks)
b. Illustrate the usage of ls command along with various options. (06 Marks)

Module-3

- 5 a. Define vi editor. Explain the different modes of vi editor. (10 Marks)
b. Write the wildcards for the following :
(i) name of a person containing only alphabets
(ii) marks of student 0 to 80
(iii) all names of the starting with lab
(iv) vowels of English alphabet
(v) names of students not starting with x, y and z
(vi) a single character after f. (06 Marks)

OR

- 6 a. Illustrate the usage of three standard files used in the shell. (06 Marks)
b. Briefly explain the application of local shell variables. (07 Marks)
c. Write a note on grep. (03 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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Module-4

- 7 a. Define Environment Variable. Explain some environment variables. (06 Marks)
 b. Explain Positional Parameters. (05 Marks)
 c. Differentiate Hard and Softlink. (05 Marks)

OR

- 8 a. Write a shell program to find the factorial of a number. (04 Marks)
 b. Explain the usage of sort command with options. (05 Marks)
 c. Given a file

```
emp.lst
101 cse pabubali prof 1234567890
110 ise vikram prof 6789012345
121 civ pratap Asst prof 1234567899
156 auto chennamma prof 9900011111
101 cse bahubali prof 1234567890
252 mech karuna prof 2222333344
```

- (i) display the top 5 employees of emp.lst.
 (ii) display the last 4 employees of emp.lst.
 (iii) cut the 3rd field of emp.lst.

(07 Marks)

Module-5

- 9 a. Explain the following : (08 Marks)
 (i) PS (ii) PID (iii) Zombie (iv) nice
 b. Name the different phases of Process Creation. Explain. (08 Marks)

OR

- 10 a. Mention the operators used for string comparison in Perl. (03 Marks)
 b. Write a Perl script to convert Decimal number to Binary number. (06 Marks)
 c. Elaborate on array handling functions used in Perl with suitable example. (07 Marks)

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15MATDIP31

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 Additional Mathematics – I

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. Find modulus and amplitude of $1 - \cos\theta + i\sin\theta$. (05 Marks)
- b. Express $\frac{3+4i}{3-4i}$ in $a+ib$ form. (05 Marks)
- c. Find the value of ' λ ' so that the points $A(-1, 4, -3)$, $B(3, 2, -5)$, $C(-3, 8, -5)$ and $D(-3, \lambda, 1)$, may lie on one plane. (06 Marks)

OR

- 2 a. Find the angle between the vectors $\vec{a} = 5\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} - 3\hat{j} + 6\hat{k}$. (05 Marks)
- b. Prove that $\begin{bmatrix} \vec{a} \times \vec{b} & \vec{b} \times \vec{c} & \vec{c} \times \vec{a} \end{bmatrix} = \begin{bmatrix} \vec{a} & \vec{b} & \vec{c} \end{bmatrix}^2$. (05 Marks)
- c. Find the real part of $\frac{1}{1 + \cos\theta + i\sin\theta}$. (06 Marks)

Module-2

- 3 a. Obtain the n^{th} derivative of $\sin(ax + b)$. (05 Marks)
- b. Find the pedal equation of $r^n = a^n \cos n\theta$. (05 Marks)
- c. If $u = \frac{yz}{x}$, $v = \frac{zx}{y}$, $w = \frac{xy}{z}$, show that $\frac{\partial(u, v, w)}{\partial(x, y, z)} = 4$. (06 Marks)

OR

- 4 a. If $u = \log\left(\frac{x^4 + y^4}{x + y}\right)$ show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 3$. (05 Marks)
- b. If $u = f(x - y, y - z, z - x)$, show that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$. (05 Marks)
- c. If $y = a \cos(\log x) + b \sin(\log x)$, show that $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0$ (06 Marks)

Module-3

- 5 a. Evaluate $\int_0^{\pi} x \sin^8 x dx$. (05 Marks)
- b. Evaluate $\int_0^1 x^2 (1-x^2)^{3/2} dx$. (05 Marks)
- c. Evaluate $\int_{-c}^c \int_{-b}^b \int_{-a}^a (x^2 + y^2 + z^2) dz dy dx$. (06 Marks)

OR

- 6 a. Evaluate $\int_0^1 \int_x^{\sqrt{x}} xy dy dx$. (05 Marks)
- b. Evaluate $\int_0^1 \int_0^1 \int_0^1 (x+y+z) dx dy dz$. (05 Marks)
- c. Evaluate $\int_0^{\infty} \frac{x^4}{(1+x^2)^4} dx$. (06 Marks)

Module-4

- 7 a. If $\vec{r} = (t^2 + 1)\hat{i} + (4t - 3)\hat{j} + (2t^2 - 6t)\hat{k}$, find the angle between the tangents at $t = 1$ and $t = 2$. (05 Marks)
- b. If $\vec{r} = e^{-t}\hat{i} + 2\cos 3t\hat{j} + 2\sin 3t\hat{k}$, find the velocity and acceleration at any time t , and also their magnitudes at $t = 0$. (05 Marks)
- c. Show that $\vec{F} = (y+z)\hat{i} + (z+x)\hat{j} + (x+y)\hat{k}$ is irrotational. Also find a scalar function ' ϕ ' such that $\vec{F} = \nabla\phi$. (06 Marks)

OR

- 8 a. Find the unit normal vector to the surface $x^2y + 2xz = 4$ at $(2, -2, 3)$. (05 Marks)
- b. If $\vec{F} = xz^3\hat{i} - 2x^2yz\hat{j} + 2yz^4\hat{k}$ find $\nabla \cdot \vec{F}$ and $\nabla \times \vec{F}$ at $(1, -1, 1)$. (05 Marks)
- c. If $\frac{d\vec{a}}{dt} = \vec{w} \times \vec{a}$ and $\frac{d\vec{b}}{dt} = \vec{w} \times \vec{b}$, then show that $\frac{d}{dt}(\vec{a} \times \vec{b}) = \vec{w} \times (\vec{a} \times \vec{b})$ (06 Marks)

Module-5

- 9 a. Solve $\sec^2 x \tan y dx + \sec^2 y \tan x dy = 0$. (05 Marks)
- b. Solve $(y^3 - 3x^2y)dx + (3xy^2 - x^3)dy = 0$. (05 Marks)
- c. Solve $\frac{dy}{dx} + \frac{y}{x} = xy^2$. (06 Marks)

OR

- 10 a. Solve $\frac{dy}{dx} + y \cot x = \cos x$. (05 Marks)
- b. Solve $x^2 y dx - (x^3 + y^3) dy = 0$ (05 Marks)
- c. Solve $y(x+y)dx + (x+2y-1)dy = 0$ (06 Marks)
