Printed Page:- **Subject Code:- BMICA0203**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

MCA (Integrated)

SEM: II - THEORY EXAMINATION (20..... - 20....)

Subject: Basic Mathematics-II

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

1-a. $\int_2^3 \frac{x}{2} dx =$ (CO1,K3) 1

(a) 1/4

(b) 3/4

(c) 5/4

(d) 2

1-b. $\int k\, dx$ is: (CO1,K1) 1

(a) kx

(b) $kx + c$

(c) $k + c$

(d) Undefined

1-c. The value of y in equation $\frac{dy}{dx} = 5$ is (CO2,K2) 1

(a) 5

(b) x+5

(c) 5x

(d) 5x+C

1-d. The P.I. of $(D^2 + 2)y = \sin x$ is (CO2,K3) 1

(a) $-\cos(x)$

(b) $\cos(x)$

(c) $\sin(x)$

(d) $-\sin(x)$

1-e. Consider a poset with elements {x, y, z} and the order relation defined as x ≤ y ≤ z.Then LUB of x and z is... (CO3,K2) 1

(a) x

(b) y

(c) z

(d) None of the above

1-f. A complemented lattice is a lattice in which: (CO3,K1) 1

(a) Every element has a unique complement

(b) Every element has at least one complement

(c) There exists a top element and a bottom element

(d) The lattice is distributive

1-g. The function $f(x,y) = x^2 + 2xy + y^2 + 4x - 2y + 3$ has a critical point at (-1,1). Then ... (CO4,K3) 1

(a) The critical point is a maximum of the function

(b) The critical point is a minimum of the function

(c) Further investigation is needed

(d) The critical point is a saddle point of the function

1-h. If $rt-s^2 > 0$ and $r<0$ at (a, b) then (CO4,K1) 1

(a) (a, b) is a local minimum point

(b) (a, b) is a saddle point

(c) (a, b) is a local maximum point

(d) Further investigation is needed

1-i. 3 books be selected from a shelf containing 10 books in number of ways.... (CO5,K3) 1

(a) 130

(b) 140

(c) 150

(d) 120

1-j. A sum of Rs. 2,500 is invested at a rate of 10% per annum compounded annually. The amount will be after 2 years is ..(CO5,K3) 1

(a) 3000

(b) 3075

(c) 3050

(d) 3025

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2. Attempt all parts:-

2.a. Evaluate $\int (e^{2x} + \cos x - 1)\,dx.$ (CO1.K3) 2

2.b. Determine I.F. of $\frac{dy}{dx} + x^2y = \cos x$ (CO2, K3) 2

2.c. Define a maximal and minimal element in a Poset. (CO3, K1) 2

2.d. Find the second order partial derivative of $f(x,y) = x^3 + 2xy^2$ with respect to y. (CO4,K3) 2

2.e. Samantha is the grandmother of Lily. Lily's father is Daniel. Find Daniel relationship with Samantha. (CO5, K2) 2

SECTION-B 30

3. Answer any five of the following:-

3-a. Solve the integral $\int \frac{1}{(x+3)(x+2)}\,dx.$ (CO1,K3) 6

3-b. Integrate $\int_0^{\pi/2} x \cos x\,dx$ (CO1,K3) 6

3-c. Using method of integrating factors, Solve: $\frac{dy}{dx} + y = e^{-x}$ (CO2,K3) 6

3-d. Using method of variable separable, Solve: $\frac{dy}{dx} = \frac{5y}{x}$ (CO2,K3) 6

3.e. Check whether R=({2,3,7,9,12},≤) is reflexive transitive or asymmetric. Also find out whether this is Poset or not.(CO3,K3). 6

3.f. Examine for maximum and minimum value of the function $u=x^2-3xy+y^2+2x$. (CO4,K3) 6

3.g. A solution contains alcohol and water in the ratio of 4:9. Calculate how much water should be added to 20 liters of the solution to make the ratio 1:2. (CO5, K3) 6

SECTION-C 50

4. Answer any one of the following:-

4-a. Evaluate by Subsitution: $\int (7x^2 + 8x - 5)^6 (7x + 4)\,dx.$ (CO1,K3) 10

4-b. Determine $\int_0^1 5x\sqrt{1-x^2}\,dx.$ (CO1,K3) 10

5. Answer any one of the following:-

5-a. Solve: $\frac{d^2y}{dx^2} + 14\frac{dy}{dx} + 49y = e^{-7x}$ (CO2,K3) 10

5-b. Solve: $(D^2 - 5D + 6)y = \sin x$ (CO2,K3) 10

6. Answer any one of the following:-

6-a. Explain the concept of a lattice and its connection to the join and meet operations. Prove that poset S = ({D_{36}}, /) is lattice. (CO3, K3) 10

6-b. Draw the Hasse diagram for the divisibility relation on each of the following sets. (CO3, K3) 10

a) A = { 2,3,4,12,24,36,48}

b) A = {3,6,9,12,24,48}

7. Answer any <u>one</u> of the following:-

7-a. 10

If z=f(y/x), then Show that $x\frac{\delta z}{\delta x}+y\frac{\delta z}{\delta y}=0$. (CO4,K3)

7-b. 10

If $u=\tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$ prove that by EULERS THEOREM

$$x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=2\sin u\cos u$$

(CO4,K3)

8. Answer any <u>one</u> of the following:-

8-a. (I). The average age of four members of a family is 52 years. One new member joins the family and the average age becomes 50. Determine the age of that new member. 10

(II). In the first 10 overs of a cricket game, the run rate was only 3.2. Calculate the run rate in the remaining 40 overs to reach the target of 282 runs. (CO5, K3)

8-b. (i) Alice walks 2 kilometers north, then turns and walks 3 kilometers east. How far is she from her starting point, and in which direction? 10

(ii) A car travels 40 kilometers north, then turns and travels 30 kilometers west. What is the straight-line distance between its starting point and final position? (CO5,K3)