Printed Page:- **Subject Code:- ABT0101**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: I - CARRY OVER THEORY EXAMINATION - AUGUST 2023

Subject: Elementary Mathematics

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. If $x^2 = 4$ then the value of x is (CO1) 1

(a) -2

(b) 2

(c) None of these

(d) -2, 2

1-b. The solution of the $-8 \le 5x - 3 \le 7$ is(CO1) 1

(a) $1 \le x < 2$

(b) $1 \le x < -2$

(c) $-1 \le x < 2$

(d) None of these

1-c. Find the derivative of $f(x) = \sin 2x + \cos 2x$ with respect to x. (CO2) 1

(a) $2\cos x - 2\sin x$

(b) $2\cos 2x - 2\sin 2x$

(c) $2\cos 2x + 2\sin 2x$

(d) None of these

1-d. Find the derivative of $f(x) = x(x+2)$. (CO2) 1

(a) $2x+2$

(b) $2x$

(c) $2x-2$

(d) None of these

1-e. The value of $\int \frac{dx}{1+x}$ is (CO3) 1

(a) $-\log(1+x) + c$

(b) $\log(1+x) + c$

(c) $-\log(1-x) + c$

(d) $\log(x-1) + c$

1-f. The value of $\int \frac{x}{x^2+4} dx$ is equal to (CO3) 1

(a) $\log(x^2+4) + c$

(b) $\frac{1}{2}\log(x^2+4) + c$

(c) $-\frac{1}{2}\log(x^2+4) + c$

(d) None of these

1-g. The order and degree of the differential equation: $x\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 - y\frac{dy}{dx} = 0$ is (CO4) 1

(a) 1 , 3

(b) 2 , 1

(c) 3 , 1

(d) 1 , 2

1-h. The general solution of the differential equation $\frac{dy}{dx} = e^{x+y}$ is (CO4) 1

(a) $e^x + e^{-y} = c$

(b) $e^x + e^y = c$

(c) $e^{-x} + e^y = c$

(d) $e^{-x} + e^{-y} = c$

1-i. Find the missing terms: 6, 5, 7, 12.5, 27, ? (CO5) 1

(a) 69

(b) 57.5

(c) 67.5

(d) 69.5

1-j. A got 37.5 % marks less than B, then by what percent the marks of B is more than the marks of A? (CO5) 1

(a) 60%

(b) 37.5%

(c) 27.27%

(d) 40%

2. Attempt all parts:-

2.a. *Solve the following inequality* $\frac{x}{2} \geq \frac{(5x-2)}{3} - \frac{(7x-3)}{5}$. (CO1) 2

2.b. Evaluate $\lim_{\theta \to \frac{\pi}{2}} \frac{1-\cos 4\theta}{\sin 2\theta}$. (CO2) 2

2.c. Evaluate $\int_{-2}^{1} (5x^2 - 7x + 3)dx$. (CO3) 2

2.d. Verify that differential equation $\frac{dy}{dx} = \frac{x^2 - y^2}{xy}$ is homogeneous . (CO4) 2

2.e. If out of 10 selected students for an examination, 3 were of 20 years age, 4 of 21 years and 3 of 22 years, then the average age of the group ? (CO5) 2

SECTION B **30**

3. Answer any <u>five</u> of the following:-

3-a. Find two-digit positive number less than 64 when its tens digit is less by 3 than units digit. (CO1) 6

3-b. *Solve* $x^2 - 2x + 2 = 0$. (CO1) 6

3-c. If x and y are connected parametrically by the equation without eliminating the parameter, find $\frac{dy}{dx}$ if $x = a \sec \theta$ *and* $y = b \tan\theta$. (CO2) 6

3-d. If $x = a(\cos t + \log \tan \frac{t}{2}), y = a \sin t$. Find $\frac{dy}{dx}$. (CO2) 6

3.e. Evaluate $\int_{2}^{1} \frac{2x^3 - 6x^2}{x^2} dx$. (CO3) 6

3.f. Find the general solution of differential equation $\frac{dy}{dx} = (1 + x^2)(1 + y^2)$. (CO4) 6

3.g. Find the missing terms of 2, 3, 19, 100, 356, 981, ?.(CO5) 6

SECTION C **50**

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

4-a. Solve $3x^2 - 2x + \frac{10}{3} = 0$ (CO1) 10

4-b. Solve 3x + 2y > 6 graphically in a two-dimensional plane. (CO1) 10

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

5-a. If $y = \sin^{-1}\left(\frac{a + b\cos x}{b + a\cos x}\right)$ then prove that $\frac{dy}{dx} = \frac{\sqrt{b^2 - a^2}}{b + a\cos x}$. (CO2) 10

5-b. Find the maxima and minima for the function $f(x) = x + \sin 2x$ in the internal $0 \le x \le 2\pi$. (CO2) 10

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

6-a. Evaluate $\int \frac{1}{9x^2 + 6x + 5}\, dx$. (CO3) 10

6-b. Evaluate $\int \frac{1}{e^x - 1} dx$. (CO3) 10

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

7-a. Solve $x\log(x)\frac{dy}{dx} + y = \frac{2}{x}\log(x)$. (CO4) 10

7-b. Solve the differential Equation $(x^2 - y^2)dx + 2xy\, dy = 0$; given that $y = 1$ when $x = 1$. (CO4) 10

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

8-a. (i) The average monthly salary of 19 members of a group is Rs. 16000. If one more member whose monthly salary is Rs. 20000 joins the group, then the average salary of the group is 10

(ii) A man purchases a certain number of toffees at 6 per rupee and the same number of toffees at 7 per rupee. He mixes the toffees and sells them at 6 per rupee. What is his gain or loss percent?

(iii) In certain code language, CHANAKYA is coded as ZBPZMZSX. How will KAUTILYA be coded in the same code language?

(CO5)

8-b. (i) Sandeep saves 30% of his salary and spends the remaining. Out of his total saving, he invests 40% in LIC policy, 35% in HDFC and the remaining on the other. If the difference between the amount invested in LIC and others is Rs135, what is his salary? 10

(ii) If the average age of 4 children is 12 years and the average age of these children and their father is 20 years, what is the age of the father ?

(iii) The marked price of a pencil is 35% more than its cost price. What maximum discount percentage can be offered by the shopkeeper to sell his pencil at no profit or no loss? (CO5)