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Subject Code:- ABT0101

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: I - THEORY EXAMINATION (2023- 2024)

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. By solving the inequality 6x - 7 > 5, the answer will be (CO1) 1

(a) x > 6

(b) x < 5

(c) x < 7

(d) x > 2

1-b. The region of the XOY-plane represented by the inequalities $x \geq 6, y \geq 2, 2x + y \leq 10$ is (CO1) 1

(a) unbounded

(b) a polygon

(c) none of these

(d) exterior of a triangle

1-c. Evaluate $\lim_{x \to 3} \frac{x^2-9}{x-3}$. (CO2) 1

(a) 2

(b) 3

(c) 0

(d) 6

1-d. Find the derivative of $\sin x$ *at* $x = 0$. (CO2) 1

(a) 1

(b) 4

(c) 3

(d) 5

1-e. $\int_0^{\frac{\pi}{2}} \cos x dx$ equals to (CO3) 1

(a) 0

(b) $\frac{\pi}{2}$

(c) 1

(d) $\frac{\pi}{4}$

1-f. 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-g. The order and degree of the differential equation: $x\left(\frac{d^2y}{dx^2}\right)^2 + 4\left(\frac{dy}{dx}\right)^3 + 8y = 7$ is (CO4) 1

(a) 2 , 2

(b) 2 , 3

(c) 1 , 3

(d) 3 , 2

1-h. The number of arbitrary constant in the general solution of the differential equation of order four is (CO4) 1

(a) 4

(b) 2

(c) 3

(d) 0

1-i. A man had 7 children. When their average age was 12 years, a child aged 6 years died. The average age of remaining six children's. (CO5) 1

(a) 13 years

(b) 10 years

(c) 11 years

(d) 14 years

1-j. Find the missing terms: 0, 7, 26, 63, 124, ? (CO5) 1

(a) 210

(b) 215

(c) 211

(d) 224

2. Attempt all parts:-

2.a. Solve the following quadratic equation (CO1) 2

$x^2 + 15x + 50 = 0.$

2.b. Evaluate $\lim_{x \to 1} 3x^2 + 4x + 5.$ (CO2) 2

2.c. Evaluate $\int \frac{x^3 + 5x^2 - 4}{x^2} dx$. (C03) 2

2.d. Find the general solution of the differential equation $\frac{dy}{dx} + y = 1.$ (CO4) 2

2.e. A toy is sold at 25% profit. If it had been sold at 15% loss, the selling price would have been Rs. 120 less. The toy costs? (CO5) 2

SECTION-B 30

3. Answer any five of the following:-

3-a. Solve $1 \leq x - 2 \leq 3.$ (CO1) 6

3-b. Find all pairs of consecutive odd positive integers both of which are smaller than 10 such that their sum is more than 11. (CO1) 6

3-c. **Differentiate $\sin(\cos x^2)$ with respect to x (CO2).** 6

3-d. **Find the derivative of $f(x) = (x^2 + 1)\cos x$. (CO2)** 6

3.e. Evaluate $\int (4x + 2)\sqrt{x^2 + x + 1}\, dx$. (CO3) 6

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

3.g. The average of 50 numbers is 38. If two numbers, namely 45 and 55 are discarded, the average of the remaining numbers is (CO5) 6

SECTION-C 50

4. Answer any one of the following:-

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

4-b. Solve the following system inequalities graphically: $5x + 4y \geq 4,\ x \geq 1,\ y \geq 2.$ (CO1) 10

5. Answer any one of the following:-

5-a. **If $y = 3e^{2x} + 2e^{3x}$ then prove that $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0.$ (CO2)** 10

5-b. If x and y are connected parametrically by the equation without eliminating the parameter, find $\frac{dy}{dx}$ *if* $x = a(\theta - \sin\theta), y = a(1 - \cos\theta).$ (CO2) 10

6. Answer any one of the following:-

6-a. Evaluate $\int e^x \cos(x) dx$.(CO3) 10

6-b. Find the area bounded by parabola $y^2 = 4x$ and a line $y = x$. (CO3) 10

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

7-a. Solve the differential Equation $\cos^2(x)\frac{dy}{dx} + y = \tan(x)$, $\left(0 \le x < \frac{\pi}{2}\right)$ (CO4). 10

7-b. Find the general solution of differential equation $x\frac{dy}{dx} + 2y = x^2$, $(x \neq 0)$. (C04) 10

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

8-a. (i) If the price of an item is decreased by 10% and then increased by 10%,then find the net effect on the price of the item. 10

(ii) The average marks obtained by 40 students of a class is 86. If the 5 highest marks are removed, the average reduced by one mark. Find the average marks of the top 5 students.

(iii) Find the missing terms: 1, 2, 6, 7, 21, 22, 66, 67, ? (CO5)

8-b. (i) If the radius of the cylinder increases by 10 % and the height increases by 20%. Then, what is the change in the volume of the cylinder ? (CO5) 10

(ii) The average age of eight teachers in a school is 40 years. A teacher among them died at the age of 55 years whereas another teacher whose age was 39 years joins them. The average age of the teachers in the school now is (in years)

(iii) A machine is sold for Rs5060 at a gain of 10%. What would have been the gain or loss % if it had been sold for Rs 4370?