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 2022

Subject: Elementary Mathematics

Time: 3 Hours Max. Marks: 100

General Instructions:

1. The question paper comprises three sections, A, B, and C. You are expected to answer them as directed.
2. Section A - Question No- 1 is 1 marker & Question No- 2 carries 2 mark each.
3. Section B - Question No-3 is based on external choice carrying 6 marks each.
4. Section C - Questions No. 4-8 are within unit choice questions carrying 10 marks each.
5. 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 If $-2 < 2x - 1 < 2$ then the value of x lies in the interval (CO1) 1

(a) (1/2, 3/2)

(b) (-1/2, 3/2)

(c) (3/2, 1/2)

(d) (3/2, -1/2)

1 The solution of $x^2 + x + 4 = 0$ is (CO1) 1

(a) $\frac{-1 \pm \sqrt{13}i}{2}$

(b) $\frac{-1 \pm \sqrt{15}i}{2}$

(c) $\frac{-1 \pm \sqrt{14}i}{2}$

(d) $\frac{-1 \pm \sqrt{15}}{2}$

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

(a) 2

(b) 3

(c) 0

(d) 6

1 Differentiate a^x w.r.t. x, where a is a positive constant. (CO2) 1

(a) a^x

(b) $a^x \log x$

(c) $a^x \log c$

(d) None of these

1 Suppose f is such that f(-x) = - f (x) for every real x and $\int_0^1 f(x)\,dx = 5$ then $\int_{-1}^{0} f(x)\,dx$ is equal to (CO3) 1

(a) 10

(b) 5

(c) 0

(d) -5

1 The value of $\int \tan(3x-5)\sec(3x-5)\,dx$ is (CO3) 1

(a) $\sec(3x-5)+c$

(b) $\frac{1}{3}\sec(3x-5)+c$

(c) $\tan(3x-5)+c$

(d) None of these

1 The order and degree of the differential equation: $\left(\frac{d^3y}{dx^3}\right) - 6\left(\frac{dy}{dx}\right)^2 - 4y = 0$ is (CO4) 1

(a) 1 , 3

(b) 2 , 1

(c) 3 , 1

(d) 1 , 2

1 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 In a certain code language, 732 means ‘intelligent trained faculty’ 285 means ‘highly intelligent student’, 816 means ‘student and teacher’. Which numerical symbol in that code language stands for ‘highly’? (CO5) 1

(a) 2

(b) 7

(c) 8

(d) 5

1 A man bought a cycle for Rs250. For how much should he sell it so as to gain 10%? (CO5) 1

(a) 250

(b) 350

(c) 275

(d) None

2. Attempt all parts:-

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

$x^2 + x + 1 = 0$

2.b. Find the derivative at x = 0 of the function $f(x) = 3x^2 + 4.$ (CO2) 2

2.c. Evaluate $\int \log(x)\, dx.$ (CO3) 2

2.d. Form the differential equation by eliminating arbitrary constant a from the equation $x^2 + y^2 = a^2$. (CO4) 2

2.e. If in a certain code “RANGE” is coded as 12345 and “RANDOM” is coded as 123678. Then the code for the word “MANGO” would be? (CO5) 2

SECTION B 30

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

3 $Solve\ \sqrt{3}x^2 - \sqrt{2}x + 3\sqrt{3} = 0.$ (CO1) 6

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

3 Find the derivative of the function $f(x) = 2x^2 + 3x - 5$ at x = -1. Also prove that $f'(0) + 3f'(-1) = 0$ (CO2) 6

3.e. Evaluate $\int \frac{2-3\sin(x)}{\cos^2 x}dx$. (CO3) 6

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

3.g. The average of 6 consecutive natural numbers is K. If the next two natural numbers are also included, how much more than K will the average of these 8 numbers be ? (CO5) 6

SECTION C 50

4. Answer any one of the following:-

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

4 Solve the following system inequalities graphically: $x + 2y \leq 10, x + y \geq 1, x - y \leq 0, x \geq 0, y \geq 0.$ (CO1) 10

5. Answer any one of the following:-

5-a. If $y = 3\cos(\log x) + 4\sin(\log x)$, show that $x^2y_2 + xy_1 + y = 0$. (CO2) 10

5-b. Prove that $f(x) = |x-2|$, $x \in R$ is not differentiable at $x = 2$. (CO2) 10

6. Answer any one of the following:-

6 Evaluate $\int x \sin x \, dx$. (CO3) 10

6 Evaluate $\int_0^1 \left(xe^x + \sin\frac{\pi x}{4}\right)dx$. (CO3) 10

7. Answer any one of the following:-

7 Solve $3e^x\tan(y)dx + (2-e^x)\sec^2(y)dy = 0$ given that $y(0) = \frac{\pi}{4}$. (CO4) 10

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

8. Answer any one of the following:-

8 (i) The average of 5 consecutive natural numbers is n. If the next two numbers are also included, find the average of the 7 numbers. 10

(ii) A retailer marks all his goods at 50% above the cost price and offers a discount of 25% on the marked price. What is his actual profit on the sales?

(iii) If A, B, C are three students. A got 20% more marks than B and 30 % less than C. if B got 175, then how much C got? (CO5)

8 (i) An article is listed at Rs.1800 and two successive discounts of 8% and 8% are given on it. 10

How much would the seller gain or loss, if he gives a single discount of 16% instead of two discounts?

(ii) In certain code, RELATION is written as ZKDQMNHS and NOSE is written as NMDR. How will MISTER be written in that code?

(iii) Out of four numbers the average of the first three is 16 and that of the last three is 15. If the last number is 20 then find the first number. (CO5)