Printed Page:- Subject Code:- ABT0101

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute)

Affiliated to Dr. A.P.J. Abdul Kalam Technical University, Uttar Pradesh, Lucknow

B.Tech

SEM: I - THEORY EXAMINATION (2021 - 2022)

Subject: Elementary Mathematics

Time: 03:00 Hours Max. Marks: 100

General Instructions:

1. All questions are compulsory. It comprises of three Sections A, B and C.

- Section A - Question No- 1 is objective type question carrying 1 mark each & Question No- 2 is very short type questions carrying 2 marks each.
- Section B - Question No- 3 is Long answer type - I questions carrying 6 marks each.
- Section C - Question No- 4 to 8 are Long answer type - II questions carrying 10 marks each.
- 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. Solution of $(x + 1)^2 + (x^2 + 3x + 2) = 0$, is (CO1) 1

1. x = -1, -3/2
2. x = -1
3. x = -2
4. None of these

1-b. If $(x + 3)/(x – 2) > 1/2$ then x lies in the interval (CO1) 1

1. $(8, \infty)$
2. $(-8, \infty)$
3. $(\infty, -8)$
4. $(\infty, 8)$

1-c. Evaluate $\lim_{x \to 3} \frac{x^2-4x+3}{x^2-2x-3}$ (CO2) 1

1. $\frac{1}{2}$
2. $-\frac{1}{2}$
3. 2
4. 0

1-d. Find the derivative of x sin x.(CO2) 1

1. $x\cos x + \sin x$
2. $x\cos x - \sin x$
3. $x\cos x$
4. None of these

1-e. The value of $\int \frac{x^2 \tan^{-1}(x^3)}{1+x^6}\, dx$ is equal to (CO3) 1

1. $\tan^{-1}(x^3) + c$
2. $\frac{1}{6}[\tan^{-1}(x^3)]^2 + c$
3. $-\frac{1}{2}[\tan^{-1}(x^3)]^2 + c$
4. $\frac{1}{2}[\tan^{-1}(x^3)]^2 + c$

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

1. $\frac{1+2x^2}{\sqrt{1+x^2}} + c$
2. $\sqrt{1+x^2} + c$
3. $3(1+x^2)^{3/2} + c$
4. $\frac{1}{3}(1+x^2)^{3/2} + c$

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

1. 2 , 2
2. 2 , 3
3. 1 , 3
4. 3 , 2

1-h. Which of the following differential equations has y = x as one of its particular solution (CO4) 1

1. $\frac{d^2y}{dx^2} - x^2\frac{dy}{dx} + xy = x$
2. $\frac{d^2y}{dx^2} - x\frac{dy}{dx} + xy = x$
3. $\frac{d^2y}{dx^2} - x^2\frac{dy}{dx} + xy = 0$
4. $\frac{d^2y}{dx^2} + x\frac{dy}{dx} + xy = 0$

1-i. Find the missing terms: 2, 11, 58, 295, 1482,? (CO5) 1

1. 6750
2. 4450
3. 6459
4. 7419

1-j. If blue is coded as green, green is coded as white and white is code as black, and then what will be the code for the colour of grass? (CO5) 1

1. White
2. Green
3. Black
4. None of These

2. Attempt all parts:-

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

$(x-1)^2 + 3x + 2 = 0.$

2.b. Examine whether the function f given by $f(x) = x^2$ is continuous at x = 0.(CO2) 2

2.c. $Evaluate \int \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2 dx$.(CO3) 2

2.d. $\text{Solve } \frac{dy}{dx} = (e^x + 1)y$.(CO4) 2

2.e. The cost price of 12 pens is equal to the selling price of 10pens. Find the gain percent.(CO5) 2

SECTION B 30

3. Answer any five of the following:-

3-a. Ben obtained 60 and 65 marks in first two terms in mathematics. Find the minimum marks he should get in the third term to have an average of at least 70 marks. (CO1) 6

3-b. $\text{Solve } 2 < \frac{1}{6} - \frac{1}{2}x \leq 4.(CO1)$ 6

3-c. Show that the derivative of sin x is cos x by applying first principle method.(CO2) 6

3-d. $\text{Find } \frac{dy}{dx} \text{ if } xy + y^2 = \tan x + y.\ (CO2)$ 6

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

3.f. $\text{Solve } \frac{dy}{dx} + y\tan(x) = \sec(x)$.(CO4) 6

3.g. 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) 6

SECTION C 50

4. Answer any one of the following:-

4-a. 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

4-b. Solve the following system of linear inequalities in two variables graphically $x + y \geq 5$, $x - y \leq 3$.(CO2) 10

5. Answer any one of the following:-

5-a. $\text{Find } \frac{dy}{dx} \text{ if } x^y + y^x = 1.\ (CO2)$ 10

5-b. The length of a rectangle x is decreasing at the rate of 5 cm/minute and the width y is increasing at the rate of 4 cm/minute. Find the rates of change of the area and perimeter of the rectangle if x = 8 cm and y = 6 cm. (CO2) 10

6. Answer any one of the following:-

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

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

7. Answer any one of the following:-

7-a. Solve the differential Equation $(x^2 + xy)dy = (x^2 + y^2)dx$.(CO4) 10

7-b. Solve $(1 + e^{2x})dy + (1 + y^2)e^x dx = 0$ given that $y(0) = 1.\ (CO4)$ 10

8. Answer any one of the following:-

8-a. (i) In certain code language SERIES is coded as 5625 and PIPE is coded as 2116. How will WAP be coded in the same code language? 10

(ii) The average marks obtained by 22 candidates in an examination are 45. The average marks of the first 10 candidates are 55 and those of the last eleven are 40.The number of marks obtained by the eleventh candidate is ?

(iii) A candidate scores 25 % marks and fails by 30 marks, while another candidate who scores 50 % marks get 20 marks more than the minimum marks required to pass the examinations. Find the maximum marks for the examination. (CO5)

8-b. (i) If in certain code 1326 is coded as 8673, and 5670 is coded as 4329, then the code for 0009 will be 10

(ii) The total population of a village is 5000. The number of male and female increases by 10% and 15% respectively and consequently the population of the village become 5600. What was the number of males in the village?

(iii) A dealer offers a discount of 10% on the marked price of an article and still makes a profit of 20%. If its marked price is Rs. 800, then the cost price is? (CO5)