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Printed Page:-04	Subject Code:- ABT0101
	Roll. No:
NOIDA INSTITUTE OF ENGINEERING	AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute A	ffiliated to AKTU, Lucknow)
B.1	lech
SEM: I - THEORY EXAN	MINATION (2024 - 2025)
Time: 3 Hours	tary Mathematics Max Marks: 100
General Instructions:	With With S. 100
IMP: Verify that you have received the question	paper with the correct course, code, branch etc.
1. This Question paper comprises of three Sectio	ns -A, B, & C. It consists of Multiple Choice
Questions (MCQ's) & Subjective type questions.	
2. Maximum marks for each question are indicat	ed on right -hand side of each question.
<i>A ssume suitable data if necessary</i>	rever necessary.
5. Preferably, write the answers in sequential ord	der.
6. No sheet should be left blank. Any written mat	erial after a blank sheet will not be
evaluated/checked.	
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SECTION-A	
1. Attempt all parts:-	
1-a. If $x^2 = -9$ then the value of x is (CO	D1, K1) 1
(a) (-2, 2)	
(b) $(-2, \infty)$	
(c) $(2, \infty)$	
(d) No solution	
1-b. If $(x + 3)/(x - 2) > 1/2$ then x lies in the	e interval (CO1, K2) 1
(a) $(8, \infty)$	
(b) (-8,∞)	
(c) (∞, -8)	
(d) $(\infty, 8)$	
1-c. $\lim 3x^2 + 4x + 5$ .	1
Evaluate $x \rightarrow 1$ (CO2, K3)	
(a) 3	
(b) 10	
(c) 12	
(d) -12	
1-d. Find the derivative at $x = 0$ of the funct	ion $f(x) = 3x^2 + 4$ . (CO2, K3) 1
(a) 4	
(b) 0	

(c) 2  
(d) 6  
1-e. 
$$\int_{0}^{\frac{\pi}{2}} \sin x \, dx \text{ equals to (CO3,K1,K3)}$$
(a) 0  
(b)  $\frac{\pi}{2}$   
(c) 1  
(d)  $\frac{\pi}{4}$   
1-f. The value of  $\int \frac{2x-5}{x^2-5x+8} dx$  is equal

The value of 
$$\int x^2 - 5x + 8^{-4x}$$
 is equal to (CO3,K3)  
(a)  $\log\left(\frac{1}{x^2 - 5x + 8}\right) + c$   
(b)  $\log(x^2 - 5x + 8) + c$   
(c)  $\frac{1}{\log(x^2 - 5x + 8)} + c$ 

(d) None of these

The order and degree of the differential equation : JEC-202 1-g.

$$\left(\frac{d^3y}{dx^3}\right) - 6\left(\frac{dy}{dx}\right)^2 - 4y = 0$$
 is (CO4,K2)

- 1,3 (a)
- 2,1 (b)
- 3,1 (c)
- 1,2 (d)
- The number of arbitrary constants in the particular solution of a differential 1-h. equation of third order are: (CO4, K2)

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- 3 (a)
- 2 (b)
- 1 (c)
- 0 (d)
- 1-i. In a family of 5 members, the average age at present is 33 years. The youngest member is 9 years old. The average age of the family just before the birth of the youngest member was (CO5,K3)
  - (a) 24 years
  - 30 years (b)
  - 29 years (c)
  - (d) None of these
- 1-j. Reduction in price of sugar by 20% allows a household to buy 45 kg more for Rs.450. Find the original price of the sugar. (CO5,K3)

(a)	Rs 2 Kg
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- Rs 2.5 Kg (b)
- Rs 3 Kg (c)
- $(\mathbf{A})$ NL

((	a) None	
2. Attem	pt all parts:-	
2.a.	State fundamental theorem of algebra. (CO1,K1)	2
2.b.	Find $\frac{d^2y}{dx^2}$ , if $y = x^3 + \tan x$ . (CO1,K3)	2
2.c.	Evaluate $\int \left(\frac{x}{a} + \frac{a}{x}\right) dx \cdot (\text{CO3,K3})$	2
2.d.	Find the Integrating Factor of the differential equation $x \frac{dy}{dx} - y = x^2$ .(CO4,K2,K3)	2
2.e.	Find the missing terms of 6, 5, 7, 12.5, 27, ? (CO5,K1,K2)	2
<b>SECTIO</b>	<u>DN-B</u>	30
3. Answe	er any <u>five</u> of the following:-	
3-a.	Numerator of the fraction is 2 less then denominator. If we lower the numerator of this fraction by one and we increase denominator by 3, the fraction shall be equal <sup>1</sup> / <sub>4</sub> . Determine the fraction. (CO1,K2)	6
3-b.	Solve $4x^2 - 4x + 1 = 0.$ (CO1,K3)	6
3-c.	Evaluate $\lim_{x \to 3} \frac{x^2 - 4x + 3}{x^2 - 2x - 3}$ . (CO2,K3)	6
3-d.	Find the derivative of $f(x) = \sin 2x + \cos 2x$ with respect tox. (CO2,K2)	6
3.e.	Evaluate $\int \frac{x}{e^{x^2}} dx$ . (CO3,K3)	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 weight of 15 oarsmen in a boat is increased by 1.6 kg when one of the crew, who weighs 42 kg is replaced by a new man. Find the weight of the new man (in kg). (CO5,K2,K3)	6
<b>SECTIC</b>	<u>DN-C</u>	50
4. Answe	er any <u>one</u> of the following:-	
4-a.	Write an inequality that describes all points in the lower half-plane below the x-	10

- axis. (CO1,K2) Solve the inequality, 3x - 5 < x + 7 when 4-b.
  - (i) x is a natural number.
  - (ii) x is a whole number.
  - (iii) when x is an integer. (CO1,K2)
- 5. Answer any one of the following:-

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5-a. If 
$$y = 3e^{2x} + 2e^{3x}$$
 then prove that  $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0.(CO2, K2, K3)$  10

5-b. Prove that 
$$f(x) = x-2$$
,  $x \in \mathbb{R}$  is not differentiable at  $x = 2$ . (CO2,K3) 10

6. Answer any one of the following:-

6-a. Evaluate 
$$\int e^{x} \cos(x) dx$$
 .(CO3,K3) 10

6-b.

Evaluate 
$$\int \frac{\sec^2 x}{\sqrt{\tan^2 x + 4}} \, dx \, . \, (CO3, K3)$$

7. Answer any one of the following:-

7-a. Solve 
$$3e^{x}\tan(y)dx + (2-e^{x})\sec^{2}(y)dy = 0$$
 given that  $y(0) = \frac{\pi}{4}$ . (CO4,K2,K3)

7-b. Solve 
$$(1+e^{2x})dy + (1+y^2)e^{x}dx = 0$$
 given that  $y(0) = 1$ . (CO4,K2,K3) 10

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

(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,K1, K3)

8-b. (i) If the radius of the cylinder increases by 10 % and the height increases by 20%. 10 Then, what is the change in the volume of the cylinder ?
(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? (CO5,K1,K3)