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Subject Code:- B/FXE2 gs BT0101 Z

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 solution of the inequality x – 1 < 2 is : (CO1) 1

(a) $(1, \infty)$

(b) (-1, 3)

(c) (1, -3)

(d) $(\infty, 1)$

1-c. Find the derivative of $y = \sin(\sin^{-1}x)$. (CO2) 1

(a) $\frac{\cos(\sin^{-1}x)}{\sqrt{1+x^2}}$

(b) $\frac{\sin(\cos^{-1}x)}{\sqrt{1-x^2}}$

(c) $\frac{-\cos(\sin^{-1}x)}{\sqrt{1-x^2}}$

(d) $\frac{\cos(\sin^{-1}x)}{\sqrt{1-x^2}}$

1-d. The derivative of function $f(x)=x^2+2x-5$ at $x=-1$ is : (CO2) 1

(a) 1
(b) -1
(c) 0
(d) -4

1-e. Integration of a^x is : (CO3) 1

(a) $\frac{e^x}{\log a}+c$
(b) $\frac{a^x}{\log a}+c$
(c) a^x+c
(d) None of these

1-f. The value of $\int x\,dx$ is : (CO3) 1

(a) x^2+c
(b) $\frac{x^2}{2}+c$
(c) 1
(d) 0

1-g. The integrating factor of the differential equation $\frac{dy}{dx}+y=2x^3$. (CO4) 1

(a) logx
(b) e^x
(c) 2
(d) None of these

1-h. The degree of differential equation $\left(\frac{d^2y}{dx^2}\right)^2+\left(\frac{dy}{dx}\right)+\sin y'=0$ is : (CO4) 1

(a) 2
(b) 3
(c) 1
(d) Not defined

1-i. Which term of the series 1+2+4+8+..... is 256 (CO5) 1

(a) 9
(b) 8
(c) 10
(d) 7

1-j. In an examination, 50% students failed in English and 40% in math and 15% students failed in both the subjects. If 200 students passed in both the subjects, find the number of students appeared in the examination? (CO5) 1

(a) 500
(b) 600
(c) 800
(d) 1000

2. Attempt all parts:-

2.a. Solve the following quadratic equations $x^2 + 15x + 50 = 0$. (CO1) 2

2.b. Find $\frac{d^2y}{dx^2}$, if $y = x^3 + 4x^2$. (CO2) 2

2.c. Evaluate the integral $\int \tan^2 x \, dx$. (CO3) 2

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

2.e. What is a single discount equivalent to three successive discounts of 5%, 10%, 20%? (CO5) 2

SECTION-B 30

3. Answer any five of the following:-

3-a. Solve the following system of linear inequalities in two variables graphically. $x + y \geq 5, x - y \leq 3$. (CO1) 6

3-b. Solve : $\sqrt{3}x^2 - 4x + \sqrt{3} = 0$. (CO1) 6

3-c. Find the derivative of $y = (x^2 + 3x + 1)\sin(3x - 2)$. (CO2) 6

3-d. If y= Asinx+Bcosx then prove that $\frac{d^2y}{dx^2} + y = 0$. (CO2) 6

3.e. Evaluate $\int x^2 \cos x \, dx$. (CO3) 6

3.f. Solve $\log\left[\frac{dy}{dx}\right] = x - 2y$. (CO4) 6

3.g. In certain code language, CHANAKYA is coded as ZBPZMZSX. How will KAUTILYA be coded in the same code language? (CO5) 6

SECTION-C 50

4. Answer any one of the following:-

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

4-b. Solve the following system of 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. Find the derivative of $\frac{a^x}{\log x}$. (CO2) 10

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

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

6-a. Evaluate $\int x^2 \sin x \, dx$. (CO3) 10

6-b. Evaluate $\int \frac{1}{\sqrt{x^2+2x+2}} dx$. (CO3) 10

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

7-a. Find the general solution of $\frac{dy}{dx} - y = x^2 e^{2x}$. (CO4) 10

7-b. Find the general solution of $(x+y)\frac{dy}{dx} = 1$. (CO4) 10

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

8-a. (a) An article costs Rs. 500 and the marked price is mentioned as Rs. 800. What is the profit % for the seller if he sells and offers a discount of 10% on the marked price? 10
(b) If GOLD is written in the form of IQNF, then how WIND should be written in the same code language ?
(c) There are 25 students in a class and the average of their ages is 15 years. The average age of the first 12 students is 14 and the average age of the last 12 students is 16. If the age of Amrutha is 5 years more than the age of 13th student, find the age of Amrutha ? (CO5)

8-b. (a) 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? 10
(b) 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. Find average age of the teachers in the school?
(c) 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)