Model Quesiton – 1

Subject : Mathematics XII (Mat. 402/008)

Time : 3 hrs **F.M. 75**

Attempt all the questions:

Group "A"

Rewrite the correct option in your answer sheet: **11X1=11**

1) If w be the cube roots of unity then the value of $(1+w-w^2)^7$ =

a. 128 w b. -128w c. 128 w^2 d. -128w^2

2) Number of ways in which 4 letters can be posted in 3 boxes is

a. 4^3 b. 3 X 4 c. 3! 4! d. 3^4

3) $Cosec^{-1}(^1/_2)$

a. 30^0 b. 60^0 c. 90^0 d. not defined

4) The general solution of $3\,cosec^2\theta - 4 = 0$ is

a. $n\pi \pm \frac{\pi}{3}$ b. $n\pi + \frac{\pi}{3}$ c. $2n\pi \pm \frac{\pi}{3}$ d. $n\pi \pm (-1)^n \frac{\pi}{3}$

5) $\vec{a} \times \vec{b}$ is a vector

a. parallel to $\vec{a}$ b.perpendicular to both $\vec{a} \times \vec{b}$

c.paralllel to $\vec{b}$ d. perpendicular to $\vec{a}$

6) The eccentricity of the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ is

a. 3 b. $\frac{5}{3}$ c. $\frac{3}{5}$ d. $\frac{4}{5}$

7) The probability of a sure event is

a. 0 b. 1 c.2 d. ½

8) The degree of the differential equation $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2 = 0$ is

a. 1 b. 2 c. 3 d. 0

9) According to L'Hospital'r rule the value of $\lim_{x \to \infty} \frac{x^3}{e^3} =$

a. 3 b. 2 c. 0 d. ∞

10) When Gauss forward elimination method is used for solving the equations 3x+4y=5 _ _ _ (1) and 3y – x = 1 _ _ _ (2) we apply the operation like

a. eq^n (1) + eq^n (2) b. eq^n (1) + 3 eq^n (2)

c. eq^n (1) + 4 eq^n (2) d. eq^n (2) + 3 eq^n (1)

11) The amount of gravity exerted by the earth on the mass 5 kg (g = 9.8m/s^2) is

a. 4.9 Joule b. 4.9 Newton c. 49 Joule d.49 Newton

OR

For the economic variable in the form of f (Q) = aQ^2 + bQ + C, where a,b, c are real numbers and a ≠ 0, the minimum value attained at

a. $\left(-\frac{b}{2a}, \frac{4ac-b^2}{4a}\right)$ b. $\left(\frac{b}{2a}, \frac{4ac-b^2}{4a}\right)$

c. $\left(-\frac{b}{2a}, \frac{b^2-4ac}{2a}\right)$ d. $\left(\frac{b}{2a}, \frac{b^2-4ac}{4a}\right)$

Group "B"

Short answer questions: **8X5=40**

12)

a) Write the middle terms in the expansion of (a+x)^n when n is odd. 2

b) Show that the middle term in the expansion of (1+x)^{2n} is $\frac{1.3.5.....(2n-1)}{n!} 2^n x^n$ 3

13)

a) State the principle of mathematical induction. 1

b) Prove by the method of induction that $1.3 + 2.4 + 3.5 + ... + n.(n+2) = \frac{n(n+1)(2n+7)}{6}$

14)

a) Prove that $\cos\left(\sin^{-1} u + \cos^{-1} v\right) = v\sqrt{1-u^2} - u\sqrt{1-v^2}$ 2

b) Using Vector method, find the area of the triangle with vertices A(1, 1, 1), B (1, 2, 3) and C (2, 3, 1). 3

15) From the following data of marks obtained by 8 students in Comptuer and Mathematics paper compute Spearman rank correlation. 5

Marks in Computer X)	25	68	45	50	80	74	50	68
Marks in Mathematics (Y)	36	40	57	40	72	75	60	40

16)

a) State Rolle's theorem. 1

b) Verify Rolle's theorem for the function $f(x) = 3x^2 - 4$ in [-1, 1] 4

17) Evaluate: $\int \frac{dx}{(x-1)^2 (x-2)^3}$ 5

18) Use Simplex method and maximize: 5

$z = 2x + y$ subject to

$x+2y \leq 10$, $x+3y \leq 12$, $x, y = 0$

19) P, Q are like parallel forces. If P is moved parallel to itself through a discatnce x, show that the resultant of P and Q moves a distance $\frac{Px}{P+Q}$ 5

OR

The demand function for a good is P = 60 – 2Q. fixed cost for a good is Rs. 192 and the variable cost for each additional unit of good is Rs. 20.

a) Write down the equation for total revenue and total cost in terms of Q. 1

b) Find the profit function in terms of Q. 1

c) Determine the maximum profit. 1

d) Present the graph of profit function. 2

Group "C"

Long answer questions: **8×3=24**

20)

a) Solve by Cramer's rule:

$3x + 2y + 9 = 0$, $2x - 3y + 6 = 0$ 2

b) If the roots of the equation $x^2 + ax + c = 0$ differ by 1, prove that $a^2 = 4c+1$. 4

c) Prove that every element in a group (G, o) has unique inverse. 4

21)

a) A plane cuts the co ordinate axes at the points A, B, C and the centroid of the triangle ABC is (1, 2, 1). Find the equation of the plane. 2

b) Reduce the above plane to the normal form and also determine the direction cosines of the normal and the length of the perpendicular to it from the origin. 4

c) For what value of K makes the line joining the points (1, 2, K) and (5, 7, 15) perpendicular to the line joining the points (4, 7, 1) and (3, 5, 3)? 4

22)

a) Find, from first principles, the differential coefficient of $e^{\sin x}$. 4

b) Solve: $2\frac{dy}{dx} = \frac{y}{x} + \frac{y^2}{x^2}$ 4

Answers:

Group A

1) (d)	2) (d)	3) (d)	4) (a)
5) (b)	6) (c)	7) (b)	8) (a)
9) (c)	10) (b)	11) (d) OR (a)	

Group B

12)

(a) $c\left(n, \frac{n-1}{2}\right) a^{\frac{n+1}{2}} x^{\frac{n-1}{2}}$, $c\left(n, \frac{n+1}{2}\right) a^{\frac{n-1}{2}} x^{\frac{n+1}{2}}$

14)

(b) $\frac{\sqrt{21}}{2}$ sq.units

15) 0.61

17) $-\frac{1}{2}\left(\frac{x-1}{x-2}\right)^2 + 3\left(\frac{x-1}{x-2}\right) - 3\log\left(\frac{x-1}{x-2}\right) - \frac{x-2}{x-1} + C$

18) Max. z=12, x = 6, y = 0

19) OR

(a) $60Q - 2Q^2$, $192 + 20Q$

(b) $-2Q^2 + 40Q - 192$

(c) 8

Group C

20)

(a) (3, 0)

21)

(a) 2x + y + 2z = 6

(b) $\frac{2x}{3} + \frac{y}{3} + \frac{2z}{3} = 2$; $\frac{2}{3} + \frac{1}{3} + \frac{2}{3}$; 2

(c) 8

22)

(a) $e^{\sin x}.\cos x$

(b) $(y-x)^2 = cxy^2$