Model Quesiton – 2

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 $z = \cos\theta + i\sin\theta$, then

a. 0 b. $2\sin n\theta$ c. $2\cos n\theta$ d. $\sin n\theta + \cos n\theta$

2) c (n, r) + c (n, r-1) =

a. c (n, n-r) b. c (n, r+1) c. c (n+1, r) d. c (n, r-1)

3) The value of $\cos(\tan^{-1} x)$ =

a. $\sqrt{1+x^2}$ b. x c. $\frac{1}{x\sqrt{x^2-1}}$ d. $\frac{1}{\sqrt{x^2+1}}$

4) If $\text{cosec}^2 x = \text{cosec}^2\alpha$ then general value of x =

a. $n\pi+\alpha$ b. $n\pi\pm\alpha$ c. $2n\pi\pm\alpha$ d. $n\pi+(-1)^n\alpha$

5) If $\left|\vec{a}\times\vec{b}\right| = \left|\vec{a}\right|\left|\vec{b}\right|$ then $\vec{a}$ and $\vec{b}$ are

a. like parallel b. unlike parallel

c. coincident d. perpendicular

6) The eccentricity of the hyperbola $x^2 - 3y^2 = 1$ is

a. $\frac{2}{\sqrt{3}}$ b. $\frac{2}{\sqrt{7}}$ c. $\frac{1}{2}$ d. $\frac{1}{4}$

7) The probability of an impossible event is

a. 1 b. 2 c.0 d. ½

8) The order of the differential equation $\left(\frac{dy}{dx}\right)^2 - 3\left(\frac{dy}{dx}\right) + 2 = 0$ is

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

9) According to L'Hospital's rule the value of $\lim_{x\to 0}\frac{x^3}{4Sin\,x} =$

a. $\frac{3}{4}$ b. 0 c. $\frac{1}{4}$ d. ∞

10) When Gauss forward elimination method is used for solving the equations 2x+5y=-11 _ _ _ (i) and 2y – x = 5 _ _ _ (ii) we apply the operation like

a. eq^n (i) + 2eq^n (ii) b. eq^n (i) + eq^n (ii)

c. eq^n (i) + 5 eq^n (ii) d. eq^n (ii) + 2 q^n (i)

11) The pull of the earth on the particle of mass 10 kg(g = 9.8 m/s^2) is

a. 9.8 J b. 9.8 N c. 98 J d.98 N

OR

For the economic variable in the form of f (Q) = aQ^2 + bQ + C, where a,b, c are real numbers and a $\neq$ 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) If $C_0, C_1, C_2, \ldots\ldots\ldots\ldots C_n$ are the binomial co-efficients in the expansion of $(1+x)^n$, show that $C_0 + C_2 + C_4, \ldots\ldots\ldots\ldots = 2^{n-1}$. 2

b) If $(1+x)^n = C_0+C_1x+C_2x^2 + \ldots\ldots\ldots\ldots +C_nx^n$, prove that $C_0^{\,2} + C_1^{\,2} + \ldots\ldots\ldots + C_n^{\,2} = \frac{2n!}{(n!)^2}$ 3

13) Find the nth term and then the sum of the first n – terms of the series:

$1^2.2 + 2^2.3 + 3^2.4 + \ldots\ldots\ldots\ldots$ 5

14)

a) Solve: $\sin x - \cos x = \sqrt{2}$ 2

b) Show that the area of the parallelogram determined by $\vec{i} + \vec{j} - 3\vec{k}$ and $-\vec{i} + 2\vec{j} - 3\vec{k}$ is $\sqrt{118}$ sq. units. 3

15) The following table gives the normal weight of a baby during the first six months of life: 5

Age in months	0	2	3	5	6
Weight	5	7	8	10	12

Estimate the weight of a baby at the age of 4 months.

16)

a) State Mean Value Theorem. 1

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

17) Evaluate: $\int \frac{dx}{2\sin x + 3\cos x}$ 5

18) Use Simplex method and maximize: 5

F= x + 3y subject to

$x+y \leq 5$, $3x+y \leq 15$, $x, y \geq 0$

19) The horizontal and vertical components of the initial velocity of a projectile are U and V respectively. If R be the range and H the greatest height attained, prove that:

a) $\frac{4H}{R} = \frac{V}{U}$ b) $\left(\frac{R}{U}\right)^2 = \frac{8H}{g}$

OR

A and D, the input – output co-efficient matrix of the demand vector respectively are given below:

$A = \begin{pmatrix} 0.1 & 0.4 \\ 0.2 & 0.2 \end{pmatrix}$ and $D = \begin{pmatrix} 560 \\ 320 \end{pmatrix}$

Find the total output.

Group "C"

Long answer questions: **3X8=24**

20)

a) Solve the system x+y = 5, x – y + 6 =3 by using row-equivalent matrices. 2

b) If α and β are roots of $px^2 + qx + q = 0$, prove that: $\sqrt{\frac{\alpha}{\beta}} + \sqrt{\frac{\beta}{\alpha}} + \sqrt{\frac{q}{p}} = 0$ 4

c) Let G = {1, -1, i , -i} where i is an imaginary unit and * stands for the binary operation of multiplication. Show that (G, *) forms a group. 4

21)

a) A line makes an angle α, β, γ, δ with four diagonals of a cube, prove that $\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\delta = 4/3$ 3

b) Prove that the lines whose direction cosines are given by the relations pl + qm + rn = 0 and amn + bnl + clm = 0 are perpendicular if $\frac{a}{p} + \frac{b}{q} + \frac{c}{r} = 0$ and parallel if $\sqrt{ap} \pm \sqrt{bq} \pm \sqrt{cr} = 0$ 5

22)

a) If f (x) = |x|, show that $f'(0)$ does not exist. 4

b) Solve: $\frac{dy}{dx} + \frac{y}{x^2} = \frac{1}{x^2}$ 4

Answers:

Group A

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

Group B

13) $t_n = n^2(n+1),\ S_n = \frac{n(n+1)(n+2)(3n+1)}{12}$
14) (a) $x = n\pi + (-1)^n \frac{\pi}{2} + \frac{\pi}{4}$
15) 9.3
17) $\frac{1}{\sqrt{13}} \log \frac{\sqrt{13} + 2 - \tan\frac{x}{2}}{\sqrt{13} - 2 + \tan\frac{x}{2}} + C$
18) Max. F=15, x = 0, y = 5
19) OR 900, 625

Group C

20) (a) (4, 1)
22) (b) $y = 1 + ce^{1/x}$