Model Quesiton – 10

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) How many numbers between 300 and 3000 can be formed with the digits 0, 1, 2, 3, 4 and 5 without repetitions?

a. 180 b. 195 c. 175 d. 200

2) The value of k so that the equation $2x^2 - (5 + k)x + 8 = 0$ has rotos numerically equal but opposite in sign is

a. k = -5 b. k = 5 c. k = 3 d. k = 8

3) $\cos\left(\tan^{-1}\frac{3}{4}\right) =$

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

4) Angle between the diagonals of a cube is

a. $\cos^{-1}\left(\frac{1}{3}\right)$ b. $\cos^{-1}\left(\frac{1}{2}\right)$

c. $\cos^{-1}\left(\pm\frac{1}{3}\right)$ d. $\cos^{-1}\left(\pm\frac{1}{2}\right)$

5) The value of I $\left(\vec{j}\times\vec{k}\right)+\vec{j}\left(\vec{k}\times\vec{i}\right)+\vec{k}\left(\vec{j}\times\vec{i}\right)$ is

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

6) The differential co-efficient of x^x is

a. $x^x \log x$ b. $x^x\left(\log x+\frac{1}{x}\right)$ c. $x^x(\log x+1)$ d. x^x-1

7) The value of $\int\frac{dx}{1-2\cos x}$ is

a. $\frac{1}{\sqrt{3}}\log\left(\frac{\sqrt{3}\tan\frac{x}{2}-1}{\sqrt{3}\tan\frac{x}{2}+1}\right)$ b. $\frac{1}{\sqrt{3}}\log\left(\frac{1+\sqrt{3}\tan\frac{x}{2}}{\sqrt{3}\tan\frac{x}{2}-1}\right)$

c. $\sqrt{3}\log\left(\frac{\sqrt{3}\tan\frac{x}{2}-1}{\sqrt{3}\tan\frac{x}{2}+1}\right)$ d. $\sqrt{3}\log\left(\frac{1+\sqrt{3}\tan\frac{x}{2}}{\sqrt{3}\tan\frac{x}{2}-1}\right)$

8) Intercepts made on the co-ordinate axes by the plane 2x-y+2z = 4 are

a. 2, 2, -4 b. 2, 2, 4 c. 2, -4, 2 d.2, 2, 2

9) The product of two regression co-efficient is

a. 1 b. -1 c. ≥ 1 d. ≤ 1

10) The system of equations:

$x_1 + x_2 + x_3 = -3$; $3x_1 + x_2 + 2x_3 = -2$; $2x_1 + 4x_2 + 7x_3 = 7$

a. consistent b. Inconsistent

c. consistent and finite solutions d. consistent and infinite many solutions

11) If a body of mass 0.5 kg and initially at rest, is subjected to a force of 2N for 1 sec then the velocity acquired during the second is

a. 4m/s b. 5 m/s c. 3 m/s d. 40 m/s

Group "B"

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

12) Show that: $\sum_{n=1}^{\infty} \frac{n^2}{(n+1)!=} = e-1$

13) Using De Moivre's theorem find the fourth root of $-\frac{1}{2}+\frac{\sqrt{3}}{2}i$

14) Find the direction cosines of the two lines which satisfy the relations

$2l + 2m - n = 0$ and $lm + mn + nl = 0$.

15)

a) Find the correlation co-effiicient between the two variables:

No. of pair of observations

Standard deviations

X	Y
10	10
2.05	2.41
42	58

Sum of the squares of devations from their respective means

Sum of the products of deviations of X and Y from their respective means = 36

b) A committee of 5 is to be formed out of 8 men and 6 women. Find the probability that in the committee there will be 3 men and 2 women.

16) Find from first principle, the derivative of sin (log x).

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

18) Solve the following LP problem, using simplex method

$2x + 3y \leq 24$

$x + 2y \leq 4$

$x, y \geq 0$

19) A stone of mass 1 kg falls from the top of a vertical cliff. After (i) falling for 3 seconds (ii) descending 800 cm, it reaches the foot of the cliff and penetrates 25 cms into the sand. Find the resistance offered by the sand. ($g = 9.8\ m/s^2$)

Group "C"

Long answer questions: **3×8=24**

20)

a) A committee is to be chosen from 12 men and 8 women and is to consist of 3 men and 2 women. How many such committee can be formed? 2

b) Let G ={0, 1, 2}. Form a composition table for G under addition modulus 3. Find the inverse element of 2. 2

c) If the quadratic equations $x^2 + qx + pr = 0$ and $x^2 + rx + pq = 0$ have one root common prove that: $p + q + r = 0$ 2

d) Using the principle of mathematical induction, show that:

$$1^2 + 2^2 + 3^2 + ...n^2 = \frac{n(n+1)(2n+1)}{6}$$

21)

a) Verify Lagrange's mean value theorem for the functions: $f(x) = x^3 + x^2 - 6x$ in [-1, 4].

b) Solve the differential equations: $(1+x^2)\frac{dy}{dx} + y = e^{\tan^{-1}x}$.

22)

a) Find the angle between the two lines whose direction cosines are given by

$4l + 3m - 2n = 0$ and $lm - mn + nl = 0$

b) Find the equation of the plane through the intersection of the planes $x + y + z = 6$ and

$2x + 3y + 4z + 5 = 0$ and perpendicular to the plane $4x + 5y - 3z = 8$.

Answers:

Group A

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

Group B

13) -1, $\pm\left(\frac{\sqrt{3}}{2}+\frac{1}{2}i\right)$,, $\pm\left(\frac{\sqrt{3}}{2}-\frac{1}{2}i\right)$
14) $l=\frac{1}{3}, m=-\frac{2}{3}, n=-\frac{2}{3}$
15) (a) 0.73 (b) $\frac{60}{143}$
16) $\frac{1}{x}\cos(\log x)$
17) $\frac{1}{x}\log\frac{\sqrt{13}+2-\tan\frac{x}{2}}{\sqrt{13}-2+\tan\frac{x}{2}}+C$
18) Max.P = 30x + 20y, when x = 11, y = 2
19) 33 kg wt.

Group C

20) (a) 6160 (b) 1
21) (b) $y=\frac{1}{2}e^{\tan^{-1}s}+ce^{-\tan^{-1}s}$ 22) a) $\text{Cos}^{-1}\frac{10}{39}$ b) x + 7y + 13z + 96 = 0