# Model Quesiton – 9

	Subject : Mathematics XII (Mat. 402/008)							
Time	: 3 hrs	<b>F.M. 75</b>						
Attem	pt all the ques	tions:						
	Group "A"							
Rewri	te the correct	option in your answ	11X1=11					
1)				ut repetitions, they can be formed in				
2)	a. 120 way	-	c. 24 ways	d. 720 ways				
2)	a. a=0	b. b=0	c. c=0	$ax^{2}+bx+c = 0$ is zero is				
	_		0.0=0	d. b=c				
3)	If $\sin^{-1} x = \frac{\pi}{5}$ then $\cos^{-1} x =$							
	a. $\frac{\pi}{10}$	b. $\frac{3\pi}{4}$	c. $\frac{3\pi}{10}$	d. $\frac{7\pi}{5}$				
4)	If a line make	es an angle of $\alpha$ , $\beta$ , $\gamma$ ,	$\delta$ with the four diag	gonals of a cube then				
	a. $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma + \sin^2 \delta = \frac{8}{3}$							
	b. $\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma + \cos^2 \delta = \frac{4}{3}$							
	c. Both a	and b						
	d. None o	of the above						
5)	The vector product of two non-zero vectors $ec{a}$ and $ec{b}$ is zero if and only if							
	a. a=0	b. b=0	c. $\vec{a}$ and $\vec{b}$ are parallel d.					
6)	$\int_0^a \frac{dx}{a^2 + x^2}$ is e	equal to						
	a. $\frac{\pi}{a}$	b. $\frac{\pi}{2a}$	c. $\frac{\pi}{3a}$	d. $\frac{\pi}{4a}$				
7)	The value of	$\lim_{x \to \frac{\pi}{2}} \frac{\tan 5x}{\tan x} \text{ is }$						
	a. $\frac{1}{5}$	b. $\frac{2}{5}$	c. $\frac{5}{2}$	d. 5				
8)	Distance between the parallel planes $2x - 2y + z + 1 = 0$ and $4x - 4y + 2z + 3 = 0$ is							
	a. 3	b. $\frac{1}{3}$	c. 6	d. $\frac{1}{6}$				
9)	The correlation coefficient between the two variables is							
	a. 1	b1	c. ≥1	d. ≤1				

- 10) The system of equations:
  - $x_1 x_2 + x_3 = 1$ ;  $3x_1 + x_2 + 5x_3 = 11$ ;  $4x_1 + 2x_2 + 7x_3 = 16$ a. consistent b. Inconsistent
    - c. consistent and finite solutions d. consistent and infinite solutions
- 11) If the pull of the earth on a mass of 5 kg is 49N, then the acceleration due to gravity is
   a. 10m/s
   b. 9.8 m/s
   c. 9.6 m/s
   d. 9.4 m/s

#### Group "B"

#### Short answer questions:

12) If  $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \dots + C_n x^n$ , prove that:

$$C_0C_n + C_1C_{n-1} + \dots C_nC_0 = \frac{(2n)!}{n!n!}$$

- 13) State De Moivre's theorem and applying De Moivre's theorem find the cube root of -1.
- 14) Find the equation of the plane through the point (-1, 1, 1) and (1, -1, 1) and perpendicular to the plane x + 2y + 2z = 5
- 15)
  - a) The regression co-efficient of x and y and y on x are 1.5 and 0.65 respectively. If the arithmetic means  $\overline{X}$  and  $\overline{Y}$  are 36 and 52 respectivel. Find the two regression equations. Also, find the value of y when x = 60.
  - b) Suppose 3 cards are drawn from a well shuffled deck of 52 cards. What is the probability of getting all black cards?
- 16) Find from first principle, the derivative of log ( $\sec x^2$ ).

17) Integrate: 
$$\int \frac{x^3 dx}{\left(x^2 - a^2\right) \left(x^2 + b^2\right)}$$

18) Maximize: g = 15x + 12y such that

 $2x+3y\leq 21$ 

 $3x + 2y \le 24$ 

 $x,\,y\geq 0$ 

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  $\frac{Px}{P+Q}$ 

Group "C"

#### Long answer questions:

20)

- a) From 10 persons, in how many ways can a committee of 4 is to be formed when one particular person is always included.
   2
- b) Show that the multiplication is a binary operation on the set  $S = \{-1, 0, 1\}$  2
- c) Find the value of k so that the equation  $4x^2 17x + k = 0$  has the reciprocal roots. 2
- d) Sum to n terms of the following series:  $1 + (1 + 2) + (1 + 2 + 3) + \dots 2$

#### 8X5=40

3X8=24

a) Verify Rolle's theorem for the function  $f(x) = \sqrt{1 - x^2}$  in the interval  $-1 \le x \le 1$ .

b) Solve: 
$$(x^2 - y^2) \frac{dy}{dx} = xy$$

22)

- a) Find the equation of the plane through the points (2, 2, 1) and (9, 3, 6) and normal to the plane 2x + 6y + 6z = 9.
- b) Find the angle between the lines whose direction cosines are given by I + m + n = 0 and 2 Im mn + 2nI = 0.

#### Answers:

**Group A** 

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

### **Group B**

13) -1, $\frac{1}{2}(1+i\sqrt{3}), \frac{1}{2}(1-i\sqrt{3})$				
14) $2x + 2y - 3z + 3 = 0$				
15) (a) $y = 0.65 x + 28.6$				
(b) $\frac{2}{17}$				
16) 2x tanx <sup>2</sup>				
17) $\frac{1}{2(a^2-b^2)} \left\{ a^2 \log(x^2+a^2) - b^2 \log(x^2+b^2) + c \right\}$				
18) Max. g = 126, x = 6, y = 3				

## Group C

20) (a) 84 (c) k = 4 (d) 
$$\frac{1}{6}n(n+1)(n+2)$$
  
21)  
(b)  $x^2 + 2y^2 \log Cy = 0$   
22) a)  $3x + 4y - 6z = 9$   
b)  $\frac{1}{\sqrt{6}}, \frac{1}{\sqrt{6}}, \frac{-2}{\sqrt{6}}, \frac{1}{\sqrt{6}}, \frac{2}{\sqrt{6}}, \frac{-1}{\sqrt{6}}$   
 $\theta = 60^\circ$