Model Quesiton – 7

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 α is a complex number such that: $\alpha^2 + \alpha + 1$ then α^{31} is

a. α b. α^2 c. 0 d. 1

2) There are 5 subjects in a exam. The number of ways in which a student may fail is

a. 16 b. 15 c. 32 d. 31

3) If tan (x+y) = 33 and x = $\tan^{-1}3$ then y = ?

a. 3:10 b. $\tan^{-1}\left(\frac{3}{10}\right)$ c. $\tan^{-1}\left(\frac{3}{8}\right)$ d. $\frac{10}{3}$

4) The curve represented by x = a sec t and y = b tan t is

a. circle b. parabola c. ellipse d. hyberbola

5) The d.c.s of any normal to xy plane are

a. 1, 0, 0 b. 0, 1, 0 c. 0, 0, 1 d. 1, 1, 0

6) (1, 0, 0) X (0, 1, 0) equals

a. (1, 1, 0) b.0 c. (0, 0, 1) d.2

7) The correlation coefficient between two variables x and y is

a. Postive b. Negative

c.Symmetrical d.non- Symmetrical

8) The slope of tangent to the curve y = 16 – x^2 at x =0

a. 0 b. -2 c. 2 d. 16

9) $\int \sin^{-1} x\, dx + \int \cos^{-1} x\, dx$ equals

a. 0 b. $\frac{\pi}{2}$ c. $\frac{\pi}{2}x$ d. $\frac{\pi}{2}x + c$

10) An LPP is called standard maximization problem if

a. The objective function is to be maximized.

b. All decision variables are non- negative.

c. All constraints are in the form $a_i\, x_i + a_j\, x_j + \ldots\ldots + a_n\, x_n \leq b$

d. All

11) The resultant of two like parallel forces P and Q is

a. P + Q b. P - Q c. Q - P d.PQ

Group "B"

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

12)

a) If the roots of $ax^2 + bx + c = 0$ be in the ratio 3:4. Prove that $12b^2 = 49\,ac$. 3

b) Using Mathematical induction, prove that: $1 + 3 + 5 + \ldots\ldots\ldots + (2n-1) = n^2$. 2

13)

a) Find the number of permutations of the digits 1, 2, 7, 2, 7, 4, 5, 2 taken all at a time. 2

b) If the successive coefficients in the expansion of $(1+x)^n$ are 28, 56 and 70. Find n. 3

14)

a) Prove that $\sin^{-1}\left(\cos\sin^{-1}x\right)+\cos^{-1}\left(\sin\cos^{-1}x\right)=\frac{\pi}{2}$ 2

b) Find the equation of an ellipse passing through points (1, 4) & (-3, 2) 3

15)

a) If the covariance between two variable x and y is 6 and standard deviation of x & y are 2.45 and 2.61 respectively. Find correlation coefficient. 1

b) In a factory the worker have a 20% chance of suffering from a disease. What is the probability that our of six four or more will contact the disease? 4

16) Find derivative of: $x\cos h^2\left(\frac{x}{a}\right)$. 5

17) Solve by separation of variables, the equaton $(x^2 - yx^2)\,dy + (y^2 + x^2y^2)\,dx = 0$ 5

18) Max Z = 40 x + 88 y

Subject to: $2x + 8y \le 60$

$5x + 2y \le 60$

$x, y \ge 0$

19) From a point on the ground at a distance x from foot of a vertical wall, a ball is thrown at an angle of 45^0 which just clear the top of the wall and afterwards sinks the ground at a distance y on other side. Prove that the height of wall is $\frac{xy}{x+y}$ 5

Group "C"

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

20)

a) Show that: $1+\frac{1+2}{2!}+\frac{1+2+3}{3!}+\frac{1+2+3+4}{4!}+\ldots\ldots=\frac{3e}{2}$ 4

b) The inverse of the inverse of element of a group is itself. 2

c) If $a, b \in G$ then $(a*b)^{-1} = b^{-1}*a^{-1}$. 2

21)

a) Solve: $\tan(\theta-\alpha)\tan(\theta+\alpha) = 1$. 2

b) Find the equation of the plane through intersection of plane is $2x - y = 0$ & $3z - y = 0$ and perpendicular to plane $4x + 3y - 3z = 8$. 3

c) In any triangle ABC, prove by vector method that: $\frac{a}{Sin\,A}=\frac{b}{SinB}=\frac{c}{Sin\,C}$ 3

22)

a) Using Lagrange's mean value theorem, find a point on the curve $f(x) = \sqrt{x-2}$ in (2, 3) where tangent is parallel to the chord joining the end points of the curve. 4

b) Evaluate: $\int \frac{x^4 + 2x^2 + 3}{x^2 + 5x + 6} dx$

Answers:

Group A

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

Group B

13) (a) 3360 (b) 8
14) (b) $3x^2 + 2y^2 = 35$
15) (a) 0.9383 (b) 0.017
16) $x^{\cos x^2}\left(\frac{x}{a}\right) S \frac{\cos h^2\left(\frac{x}{a}\right)}{x} + \frac{\ln x \sin h \frac{2a}{a}}{a}$
18) 840 at (10, 5)

Group C

21) (a) $x\pi$ (b) $28x - 17y + 9z = 0$
22) (a) $\left(\frac{9}{4}, \frac{1}{2}\right)$ (b) $\frac{x^3}{3} - \frac{5x^2}{2} + 21x - 102\log(x-3) + 27\log(x+z) + c$