Time : 3:00 hrs. F.M. : 75
P.M. : 30

Group 'A'

1. Which one of the following is the symbolic form of connective in the statement "students are hardworking and happy"?

   a) $\vee$ b) $\wedge$ c) $\Rightarrow$ d) $\Leftrightarrow$

2. Let A, B and C are subsets of universal set U, such that $A \subseteq B$ then

   a) $C-B \subseteq C-A$ b) $C-A \subseteq C-B$

   c) $\bar{A} \subseteq B$ d) $\bar{A} \subseteq \bar{B}$

3. If $|2x-1| < 5$, $x \in R$, then the possible value of x lies in the interval

   a) $(-\infty, 3)$ b) $(-2, 3)$

   c) $(-\infty, -2) \cup (3, \infty)$ d) $(3, \infty)$

4. What is the determinant of $A = [-3]$?

   a) 3 b) -3 c) 0 d) 1

5. One of zero's of the polynomial $f(x) = x^2 - x - 2$ is

   a) 0 b) 1 c) 2 d) -2

6. Which one of the following is not parallel to $y = 4x - 7$?

   a) $y = 4x - 7$ b) $4x + y = 10$ c) $y - 7 = 4(x - 2)$ d) $x = \frac{y}{4}$

7. The sum of slopes of the lines represented by $x^2 + 2hxy - 6y^2 = 0$ is equal to the product of slopes then h equal to

   a) 4 b) -2 c) -6 d) 8

8. Which one of the following expression doesn't representing indeterminate form

a) $\frac{0}{0}$ b) $0\times\infty$ c) $\frac{\infty}{0}$ d) 1^{∞}

9. Value of $\lim_{x\to 0}\frac{1}{x}$ is

a) 0 b) 1 c) -1 d) doesn't exist

10. $\lim_{x\to\infty} x \sin\frac{1}{x}$ is

a) 1 b) -1 c) 0 d) can not be said

11. Given function $f(x)=\frac{|x|}{x}$, then f(x) is discontinuous at x = 0 because

a) limit doesn't exist

b) limiting values infinity

c) limit exist but not equal to functional value

d) Functional value is infinity

Group 'B'

12. a) Define conjunction of two statements [1]

b) Let p and q be any two statement, prove that:

$\sim(p\vee q)\equiv(\sim p\wedge\sim q)$ [3]

c) Find the truth value of statement "If $2\times3=6$ or $2+3=6$ then $5<0$" [1]

13. a) If A, B and C are subsets of universal set U then prove that $A\cap(B\cup C)=(A\cap B)\cup(A\cap C)$. [2]

b) For any two real numbers x and y show that $|x+y|\le|x|+|y|$ [3]

14. a) Find the distance from the point $(-2,-3)$ to the line $2x-3y+5=0$. [2]

b) Find the equation of the bisector of the angles between the lines $3x-2y=5$ and $6x+2y+15=0$ which contains the origin. [3]

13. a) Write the conditions for angle between pair of straight line represented by $ax^2+2hxy+by^2=0$ to be perpendicular. [1]

b) If p and p' be the length of the perpendicular from the origin upon the straight line whose equation are $x\sec\theta + y\,\text{cosec}\theta = a$ and $x\cos\theta - y\sin\theta = a\cos 2\theta$, prove that $4p^2 + p'^2 = a^2$. [4]

16. a) If α & β are the roots of $px^2+qx+q=0$, prove that $\sqrt{\frac{\alpha}{\beta}}+\sqrt{\frac{\beta}{\alpha}}+\sqrt{\frac{q}{p}}=0$. [3]

b) If the equation $x^2 + (k+2)x + 2k = 0$ has equal roots, find value of 'k'? [2]

17. a) Define symmetric matrix. [1]

b) If $A=\begin{pmatrix}2 & 4 & 3\\ 2 & 3 & 4\\ 5 & 2 & 6\end{pmatrix}$

i) Find A^T [1]

ii) Show that the sum of given matrix and its transpose is a symmetric matrix. [1]

c) If $A=\begin{pmatrix}4 & x+2\\ 2x-1 & 0\end{pmatrix}$ and $A = A^T$, find the value of x. [2]

18. Find the limiting values of $\lim_{y\to 0}\frac{(x+y)\sec(x+y)-x\sec x}{y}$ [5]

19. a) What do mean by indeterminate form. Give Example. [1]

b) Do the function $f(x)=\frac{x-1}{x+2}$ define for the value $x=-2$? [1]

c) Evaluate: $\lim_{x\to 0}\frac{e^{2x}-1}{x.\,2^{x+1}}$ [3]

Group 'C'

20. a) Function f(x) is defined by

$$f(x)=\begin{cases} x^2-1 & \text{for } x<2 \\ 2x & \text{for } x=2 \\ x+1 & \text{for } x>2 \end{cases}$$

i) Is the function continuous at $x=2$?

ii) If not how can you make it continuous at $x=2$. [4]

b) Evaluate: $\lim_{x\to 2} \frac{x-\sqrt{8-x^2}}{\sqrt{x^2+12}-4}$

21. a) Find the equation to the pair of straight line joining the origin to the intersection of the straight line $y = mx+c$ and the curse $x^2+y^2=a^2$, prove that they are right angled if $2c^2=a^2(1+m^2)$. [4]

b) Solve the inequality $|2x-1| \geq 3$ and draw its graph. [4]

22. a) The sum of the roots of the equation $\frac{1}{x+a}+\frac{1}{x+b}=\frac{1}{c}$ is zero. Prove that the product of the roots is $-\frac{1}{2}(a^2+b^2)$.

b) Find the Coordinates of the points which is equidistant from the four pints O, A, B & C where O is origin A, B & C are the points on the x, y, z axis respectively at a distances a, b, & c from the origin. [4]