

Group 'A'

Attempt all questions.

11×1=11

1. If  ${}^nC_{18} = {}^nC_{12}$ , then  ${}^{32}C_n = ?$   
 a) 248      b) 496      c) 992      d) none of these
2. The number of terms in the expansion of  $(2x + 3y)^{17}$  is:  
 a) 16      b) 17      c) 18      d) 34
3. If  $z$  is any non zero complex number, then  $\arg(z) + \arg(\bar{z})$  is equal of:  
 a) 0      b)  $\frac{\pi}{2}$       c)  $\pi^2$       d)  $\frac{3\pi}{2}$
4. In  $\triangle ABC$ ,  $a = 5$ ,  $b = 7$  and  $\sin A = \frac{3}{4}$ , how many such triangles are possible?  
 a) 1      b) 0      c) 2      d) infinitely many
5. If the line  $lx + my + n = 0$  is a normal to the circle  $x^2 + y^2 + 2gx + 2fy + c = 0$ , then  
 a)  $n + lg + mf = 0$       b)  $n = lg + mf$   
 c)  $n - lg + mf = 0$       d)  $n + lg - mf = 0$
6. If  $\left| \vec{a} + \vec{b} \right| = \left| \vec{a} - \vec{b} \right|$ , then  
 a)  $\left| \vec{a} \right| = \left| \vec{b} \right|$       b)  $\vec{a} \parallel \vec{b}$   
 c)  $\vec{a} \perp \vec{b}$       d) none of these

7.  $\int \sqrt{1 + \sin x} \, dx = ?$   
 a)  $-\sqrt{2} \sin\left(\frac{\pi}{4} - \frac{x}{2}\right) + c$       b)  $\sqrt{2} \sin\left(\frac{\pi}{4} - \frac{x}{2}\right) + c$   
 c)  $-2\sqrt{2} \sin\left(\frac{\pi}{4} - \frac{x}{2}\right) + c$       d) none of these

8. The solution of  $\frac{dy}{dx} = e^{x+y}$  is  
 a)  $e^x + e^y = c$       b)  $e^x - e^y = c$   
 c)  $e^x + e^{-y} = c$       d) none of these

9. Let  $P(n)$  be the statement ' $n(n+1)$  is divisible by 2'. Then,  
 a)  $P(1)$  is true but  $P(2)$  is false  
 b)  $P(2)$  is true but  $P(1)$  is false  
 c) Both  $P(1)$  &  $P(2)$  are true  
 d) Both  $P(1)$  &  $P(2)$  are false

10. The system  $x - y = 1$  and  $x - y = 5$  has  
 a) one solution      b) infinitely many solution  
 c) no solution      d) none of the above

11. In simplex method, the feasible basic solution must satisfy the  
 a) non-negativity constraints      b) negative constraint  
 c) basic constraint      d) common constraint

Group 'B'

8×5= 40

12. a) Define factorial. [1]  
 b) Find the number of ways in which 5 courses out of 8 can be selected when 3 courses are compulsory. [2]  
 c) A kabaddi coach has 14 players ready to play. How many different team of 7 players could the coach put on the court. [2]



13. a) ✓ If  $z = x + iy$ , then what does  $|z|$  represents. [1]  
 b) ✓ If  $\alpha = \frac{1}{2}(-1 + \sqrt{-3})$ ,  $\beta = \frac{1}{2}(-1 - \sqrt{-3})$ , show that  $\alpha^4 + \alpha^2\beta^2 + \beta^4 = 0$ . [2]  
 c) ✓ Express the complex number in Cartesian form whose modulus is 6 and amplitude is  $60^\circ$ . [2]
14. a) ✓ In any triangle ABC, if  $2\cos A = \sin B : \sin C$  show that the triangle is isosceles. [2]  
 b) ✓ Solve the triangle if  $a = 2$ ,  $b = \sqrt{6}$  and  $c = \sqrt{3} - 1$ . [3]
15. a) Find the equation of circle which touches both the axis and has its centre on the line  $x - 2y = 3$ . [2]  
 b) Find the condition for the circle  $x^2 + y^2 = a^2$  and  $(x-c)^2 + y^2 = b^2$  to touch internally. [1]  
 c) Find the focus and directrix of the parabola  $x^2 = 12y$ . [2]
16. a) ✓ Find the projection of  $\vec{a}$  on  $\vec{b}$ , if  $\vec{a} = (3, 1, 2)$  and  $\vec{b} = (2, -2, 4)$ . [2]  
 b) ✓ Prove that  $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a}$  if  $\vec{a} + \vec{b} + \vec{c} = 0$ . [2]  
 c) ✓ Define dot product of vector. [1]
17. a) ✓ Evaluate:  $\int \frac{1}{x(x^n - 1)} dx$ . [3]  
 b) ✓ Evaluate:  $\int \frac{1}{\sqrt{a^2 - x^2}} dx$ . [2]
18. a) Define order and degree of differential equation with suitable example. [2]  
 b) Solve the differential equation:  
 $\frac{dy}{dx} + \frac{1 + \cos 2y}{1 - \cos 2y} = 0$ . [3]
19. ✓ Using the simplex method, maximize subjected to:  
 $P = 15x + 10y$ , subjected to:  $2x + y \leq 10$  and  $x + 3y \leq 10$ ,  $x, y \geq 0$ . [5]

20. a) Write the general term of the binomial expansion of  $(x + a)^n$  &  $(a - x)^n$ . [2]  
 b) ✓ Find the middle term in the expansion of  $(x + \frac{1}{x})^{18}$ . [2]  
 c) ✓ Prove using vector method:  
 $\cos(A+B) = \cos A \cos B - \sin A \sin B$ . [4]
21. a) For the given series  $n+2, (n-1) + 3(n-2) + \dots$  Find,  
 i)  $n^{\text{th}}$  term [2]  
 ii) sum of  $n^{\text{th}}$  term [2]  
 b) ✓ Determine consistency and independence of the system of linear equation.  
 $3x - 2y = 3, -4y + 6x = 9$  [2]  
 c) ✓ Solve the equations  $x = 2y$  and  $3x + 2y = 8$  by using Cramer's rule. [2]
22. a) Evaluate:  $\int \sqrt{x^2 - a^2} dx$  [4]  
 b) ✓ Does  $x \frac{dy}{dx} = \sqrt{x^2 + y^2} + y$  represent a homogenous differential equation?  
 Give reason also solve the equation. [4]

'Good Luck'

$$\frac{1}{n} \log\left(\frac{P}{P_0}\right) + C //$$