



9. If  $rt - s^2 > 0$  and  $r < 0$  at  $(a, b)$  then the point is 1 1 3  
 (A) Maximum point (B) minimum point  
 (C) saddle point (D) none of these
10. If  $u = x + y$ , where  $x = t$ ,  $y = e^t$ , then  $du/dt$  is 1 1 3  
 (A)  $e^t$  (B)  $t$   
 (C)  $t + e^t$  (D)  $1 + e^t$
11. The stationary points of  $2x^2 - 4x - y^2$  is 1 1 3  
 (A)  $(1, 0)$  (B)  $(0, 1)$   
 (C)  $(0, -1)$  (D)  $(-1, 0)$
12. If  $f(x, y) = e^{xy}$  then  $f_{xx}(1, 1)$  is 1 1 3  
 (A)  $-e$  (B)  $-1/e$   
 (C)  $e$  (D)  $1/e$
13. A surface generated by a line which passes through a fixed point and makes a constant angle with a fixed line through the fixed point. 1 1 4  
 (A) Cone (B) Right Circular Cone  
 (C) Cylinder (D) Right Circular Cylinder
14. A surface generated by a line which intersects a fixed circle and is perpendicular to the plane of the circle is 1 1 4  
 (A) Cone (B) Right Circular Cone  
 (C) Cylinder (D) Right Circular Cylinder
15. The centre of the sphere  $x^2 + y^2 + z^2 - 2x + 4y - 4z = 0$  1 1 4  
 (A)  $(-1, 2, -2)$  (B)  $(-2, 4, -4)$   
 (C)  $(2, -4, 4)$  (D)  $(1, -2, 2)$
16. The distance between the parallel planes  $2x - 2y + z + 3 = 0$  and  $4x + 4y + 2z + 5 = 0$  1 1 4  
 (A)  $1/6$  (B)  $1/5$   
 (C)  $1/3$  (D)  $1/2$
17. Changing the order of integration in the double integral based on 1 1 5  
 (A) limits (B) function  
 (C) region (D) order
18. The value of  $\int_0^1 \int_0^2 \int_0^3 dx dy dz$  is 1 1 5  
 (A) 2 (B) 4  
 (C) 6 (D) 0
19. The curve  $y^2 = 4x$  is a 1 1 5  
 (A) Straight line (B) Parabola  
 (C) Ellipse (D) Hyperbola
20. Evaluation of  $\int_0^1 \int_0^1 dx dy$  1 1 5  
 (A) 1 (B) 2  
 (C) 3 (D) 0

**PART – B (5 × 4 = 20 Marks)**

Answer ANY FIVE Questions

Marks BL CO

21. If 3 and 2 are the eigen values of the matrix  $A = \begin{bmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{bmatrix}$  find the eigen values of  $A^{-1}$  and  $A^3$ . 4 2 1
22. Determine the nature of the quadratic form  $x_1^2 + 3x_2^2 + 6x_3^2 + 2x_1x_2 + 2x_2x_3 + 4x_1x_3$  without reducing them to canonical form. 4 3 1
23. Find the envelop of the family of straight lines  $y = mx + \sqrt{a^2m^2 + b^2}$ , where m is the parameter. 4 2 2
24. Find  $\frac{dy}{dx}$ , if  $3x^2 + xy - y^2 + 4x - 2y + 1 = 0$ . 4 2 3
25. Find the Taylor series expansion of  $e^x \cos y$  at the point (0, 0) up to second degree terms. 4 1 3
26. Find the equation of the right circular cone with origin as vertex and the axes of coordinates as its three generators. 4 2 4
27. Evaluate  $\int_0^\pi \int_0^{a \sin \theta} r \, dr \, d\theta$ . 4 1 5

**PART – C (5 × 12 = 60 Marks)**

Answer ALL Questions

Marks BL CO

28. a. Verify the Cayley Hamilton theorem for the matrix  $A = \begin{bmatrix} 2 & -1 & 2 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$  and hence find  $A^4$ . 12 2 1
- (OR)
- b. Reduce the quadratic form  $2x_1^2 + 6x_2^2 + 2x_3^2 + 8x_1x_3$  to canonical form by orthogonal reduction. Find also the nature of the quadratic form. 12 2 1
29. a. Find the evolutes of the parabola  $y^2 = 4ax$ . 12 3 2
- (OR)
- b. Find the circle of curvature of the curve  $\sqrt{x} + \sqrt{y} = 1$  at the point of  $\left(\frac{1}{4}, \frac{1}{4}\right)$  12 3 2

30. a. A rectangular box open at the top, is to have a volume of 32 cc. Find the dimensions of the box, that requires the least material for its construction. 12 2 3

(OR)

- b. Find the Taylor series expansion of  $x^2 + y^2 + 2x^2y + 3xy^2$  at the point  $(-2, 1)$  upto second degree terms. 12 2 3

31. a. Find the equation of the sphere passing through the points  $(1, 1, -1), (-5, 4, 2), (0, 2, 3)$  and having its centre on the plane  $3x + 4y + 2z = 6$ . 12 3 4

(OR)

- b. Find the equation of the right circular cylinder whose axis is  $\frac{x-1}{2} = \frac{y-3}{2} = \frac{z-5}{-1}$  and radius 3. 12 3 4

32. a. Evaluate  $\int_0^2 \int_1^3 \int_1^2 xy^2 z \, dz \, dy \, dx$ . 12 2 5

(OR)

- b. Change the order of integration in the integral  $\int_0^4 \int_{\frac{x^2}{4}}^{2\sqrt{x}} dy \, dx$ . 12 2 5

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