

**GS-646**

10

II Semester B.C.A. Examination, May/June - 2019

(Y2K8) (Repeaters)

**COMPUTER SCIENCE****BCA 203 : Mathematics**

Time : 3 Hours

Max. Marks : 100

**Instruction :** Section A, B, C, D and E is compulsory to all students.**SECTION - A****10x2=20****I.** Answer **any ten** of the following :

1. Define a Unit Matrix with an example.
2. If  $A = \begin{bmatrix} 2 & 4 & 6 \\ 3 & 5 & 6 \end{bmatrix}$  show that  $(A')' = A$ .
3. Define Sub Groups with an example.
4. In a group of integer \* defined by  $a*b = a + b - 1$  find the identity and inverse.
5. Find the  $n^{\text{th}}$  derivative of  $\sin(2x-1)$
6. Find the  $n^{\text{th}}$  derivative of  $\cos^4 x$
7. Find the unit vector of  $\vec{a} = 2\hat{i} + 2\hat{j} + 3\hat{k}$
8. Show that the vectors  $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ ,  $\vec{b} = 3\hat{i} + 4\hat{j} + 2\hat{k}$  and  $\vec{c} = 3\hat{i} + \hat{j} + 5\hat{k}$  are coplanar.
9. Evaluate :  $\int_0^1 \frac{dx}{3x-y}$

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10. Evaluate :  $\int_0^2 x^3 dx$
11. Find the order and degree of  $\left(\frac{dy}{dx}\right)^2 + 2y = \sin x$
12. Find the integrating factor of  $\frac{dy}{dx} + \frac{2}{x} y = x^3$
13. Find the distance between the points  $P(x-y, y-x)$  and  $Q(x+y, x+y)$ .
14. Find the third vertex of a triangle if two of its vertices are at  $(-2, 4)$  and  $(7, -3)$  and the centroid at  $(3, 2)$ .
15. Find the direction cosines of the line joining the points  $(3, -4, 6)$  and  $(4, -2, 7)$ .

### SECTION - B

II. Answer **any four** of the following :

**4x5=20**

16. Using Cramer's Rule find, the solution for the system of equations  $3x + y + z = 3$ ,  $2x + 2y + 5z = -1$ ,  $x - 3y - 4z = 2$ .
17. Solve the equations using matrix method  $x + y + z = 7$ ,  $2x + 3y + 2z = 17$  and  $4x + 9y + z = 37$ .
18. Using Cayley-Hamilton theorem find the inverse of the matrix
- $$A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$$
19. Find the  $n^{\text{th}}$  derivative of  $\cos(ax+b)$
20. Find the  $n^{\text{th}}$  derivative of  $\tan^{-1}\left(\frac{24}{1-x^2}\right)$
21. If  $y = a \cos(\log x) + b \sin(\log x)$  show that  $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0$

**SECTION - C****III.** Answer **any four** of the following :**4x5=20**

22. Show that the cube roots of unity form an abelian group with respect to multiplication.
23. Prove that  $G = \{0, 1, 2, 4, 5\}$  is an abelian group under addition mod 6.
24. Prove that  $H = \{1, 2, 4\}$  is a subgroup of the group  $G = \{1, 2, 3, 4, 5, 6\}$  under  $\otimes_7$ .
25. If  $\vec{a} = \hat{i} - \hat{j} + 2\hat{k}$ ,  $\vec{b} = 2\hat{i} + 3\hat{j} - \hat{k}$  find  $(\vec{a} + 2\vec{b}) \cdot (2\vec{a} - \vec{b})$
26. Show that the points A (1, 2, 3), B (2, 3, 1) and C (3, 1, 2) are vertices of an equilateral triangle.
27. If the vector  $4\hat{i} + 11\hat{j} + m\hat{k}$ ,  $7\hat{i} + 2\hat{j} + 6\hat{k}$  and  $\hat{i} + 5\hat{j} + 4\hat{k}$  are coplanar, then find 'm'.

**SECTION - D****IV.** Answer **any four** of the following :**4x5=20**

28. Evaluate :  $\int \frac{1}{10x - x^2 - 22} dx$
29. Evaluate :  $\int \frac{2x+1}{(x+3)(x-1)^2} dx$
30. Evaluate :  $\int_0^1 \frac{5x}{(4+x^2)^2} dx$
31. Solve  $e^x \tan y dx + (1 - e^x) \sec^2 y dy = 0$
32. Solve :  $\frac{dy}{dx} = \frac{1}{\cos(x+y)}$
33. Solve :  $\frac{dy}{dx} + 1 = e^{x+y}$

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## SECTION - E

2x5=10

V. Answer **any two** of the following :

34. Prove that the points (3, 4), (6, 8), (8, 9) and (6, 4) form a parallelogram.

35. If a vertex of triangle is (1, 1) and mid points of two sides through this vertex are (-1, 2) and (3, 2) then find the centroid of the triangle.

36. Find k such that the lines  $\frac{x-1}{2} = \frac{y-2}{2k} = \frac{z+1}{-1}$  and  $\frac{x+1}{k} = \frac{y+1}{4} = \frac{z-2}{1}$  are (i) Parallel and (ii) Perpendicular

37. Find the equation to the locus of a point which moves so that its distance from x-axis is three times its distance from the y-axis.

VI. Answer **any two** of the following :

2x5=10

38. Find the equation of the plane passing through the point (1, -2, 4) and perpendicular to the line  $\frac{x-1}{2} = \frac{y+3}{1} = \frac{z+1}{-1}$

39. Show that the points A(2, 3, -1), B(1, -2, 3), C(3, 4, -2) and D(1, -6, 6) are coplanar.

40. Evaluate  $\int \frac{dx}{\sin x + \cos x}$

41. Solve  $(x-y)dy - (x+y)dx = 0$