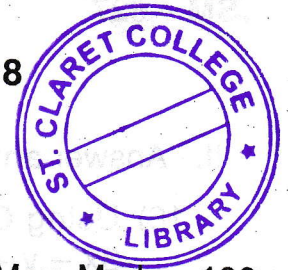




SM – 627

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II Semester B.C.A. Examination, May/June 2018
(Y2K8 Scheme)
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

I. Answer any ten of the following : (10×2=20)

- 1) Define a scalar matrix with an example.
- 2) If $A = \begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 \\ -3 & 2 \end{bmatrix}$ find AB and BA.
- 3) Define an order of a group with an example.
- 4) In a group of integers $*$ defined by $a * b = a + b - 1$ find the identity and inverse.
- 5) Find the n^{th} derivative of $\sin(ax + b)$.
- 6) Find the n^{th} derivative of $\cos^4 x$.
- 7) Find the unit vector of $\vec{a} = i + 2j - 3k$.
- 8) Show that the vectors $\vec{a} = i + j + k$, $\vec{b} = 3i + 4j + 2k$ and $\vec{c} = 3i + j + 5k$ are coplanar.
- 9) Find $\int \sqrt{1-4x} dx$.
- 10) Evaluate $\int \frac{1}{\sqrt{9-4x^2}} dx$.
- 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(1, -3, -4) and Q(-4, 1, 2).
- 14) Find the centroid of the triangle (4, 7, -6) (0, -5, 7) and (7, -8, 9).
- 15) Find the direction cosines of the vector $2i + j - 2k$.

P.T.O.



SECTION - B

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

(4×5=20)

16) Using Cramer's rule, find the solution for the system of equations
 $3x - y + 2z = 13$, $2x + y - z = 3$ and $x + 3y - 5z = -8$.

17) Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 1 & 4 \\ 3 & 2 \end{bmatrix}$.

18) Using Caley-Hemilton theorem, find A^2 if $A = \begin{bmatrix} -1 & 3 \\ -2 & 4 \end{bmatrix}$.

19) Find the n^{th} derivative of $\sin(ax + b)$.

20) Find the n^{th} derivative of $\tan^{-1} \left[\frac{1+x}{1-x} \right]$.

21) If $y = e^{\tan^{-1}x}$ prove that $(1 - x^2)y_n + [2(n - 1)x - 1]y_{n-1} + (n - 2)(n - 1)y_{n-2} = 0$.

SECTION - C

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

(4×5=20)

22) Show that fourth roots of unity form an abelian group under multiplication.

23) Prove that $G = \{1, 5, 7, 11\}$ is a group under multiplication modulo 12.

24) Prove that $H = \{0, 2, 4\}$ is a subgroup of a group $G = \{0, 1, 2, 3, 4, 5\}$ under \oplus_6 .

25) Using vector method find the area of triangle whose vertices are $A(1, 2, 3)$, $B(2, 5, 1)$ and $C(-1, 1, 2)$.

26) Find the sine of the angle between the vectors $2\mathbf{i} - 3\mathbf{j} + \mathbf{k}$ and $3\mathbf{i} + \mathbf{j} - 2\mathbf{k}$.

27) Find the unit vector coplanar with \vec{a} and \vec{b} perpendicular to \vec{c} given $\vec{a} = 2\mathbf{i} - \mathbf{j} - \mathbf{k}$,
 $\vec{b} = \mathbf{i} + 3\mathbf{j} + \mathbf{k}$, $\vec{c} = -\mathbf{i} - 2\mathbf{j} + \mathbf{k}$.

SECTION - D

IV. Answer **any 4** of the following :

(4×5=20)

28) Evaluate $\int \frac{3x+2}{4x^2+4x+5} dx$.

29) Evaluate $\int \frac{x \sin^{-1} x}{\sqrt{1-x^2}} dx$.



30) Evaluate $\int_0^{\pi/2} \frac{\sin x}{1 + \cos^2 x} dx$.

31) Solve $e^x \tan y \, dx + (1 - e^x) \sec^2 y \, dy = 0$.

32) Solve $\frac{dy}{dx} + \frac{2}{x}y = x \log x$.

33) Solve $(e^y + 1) \cos x \, dx + e^y \sin x \, dy = 0$.

SECTION – E

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

(2×5=10)

34) Show that the points (1, 3, 4) (-1, 6, 10) (-7, 4, 7) and (-5, 1, 1) are the vertices of a rhombus.

35) Find the angle between the diagonals of a cube.

36) Find the equation of a line passing through the point of intersection of the lines $\frac{x-1}{2} = \frac{y-1}{2} = \frac{z+2}{3}$ and $\frac{x+2}{2} = \frac{y-5}{-1} = \frac{z+3}{2}$ and perpendicular to both of them.

37) Find the locus of points which are equi-distant from the points A(-1, 2, 3) and B(3, 2, 1).

SECTION – F

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

(2×5=10)

38) Find the equation of the line passing through the point of intersection of the lines $x - 7y + 5 = 0$ and $3x + y - 7 = 0$ and parallel to y - axis.

39) Show that the vectors $\vec{a} = i + j + k$, $\vec{b} = 3i + 4j + 2k$ and $\vec{c} = 3i + j + 5k$ are coplanar.

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

41) Solve $\frac{dy}{dx} - 2y \tan x = y^2 \tan^2 x$.
