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II Semester B.C.A. Degree Examination, May/June 2014
(Y2K8 Scheme) (2008-09 & Onwards)
BCA 203 : MATHEMATICS
(F+R 100 – 2011-12 and Onwards)
(R-90 Prior to 2011-12)

Time : 3 Hours

Max. Marks : 90/100

Instructions: 1) Answer **all** Section.

2) Section **F** is applicable to the students who have taken admission in **2011** and Onwards.

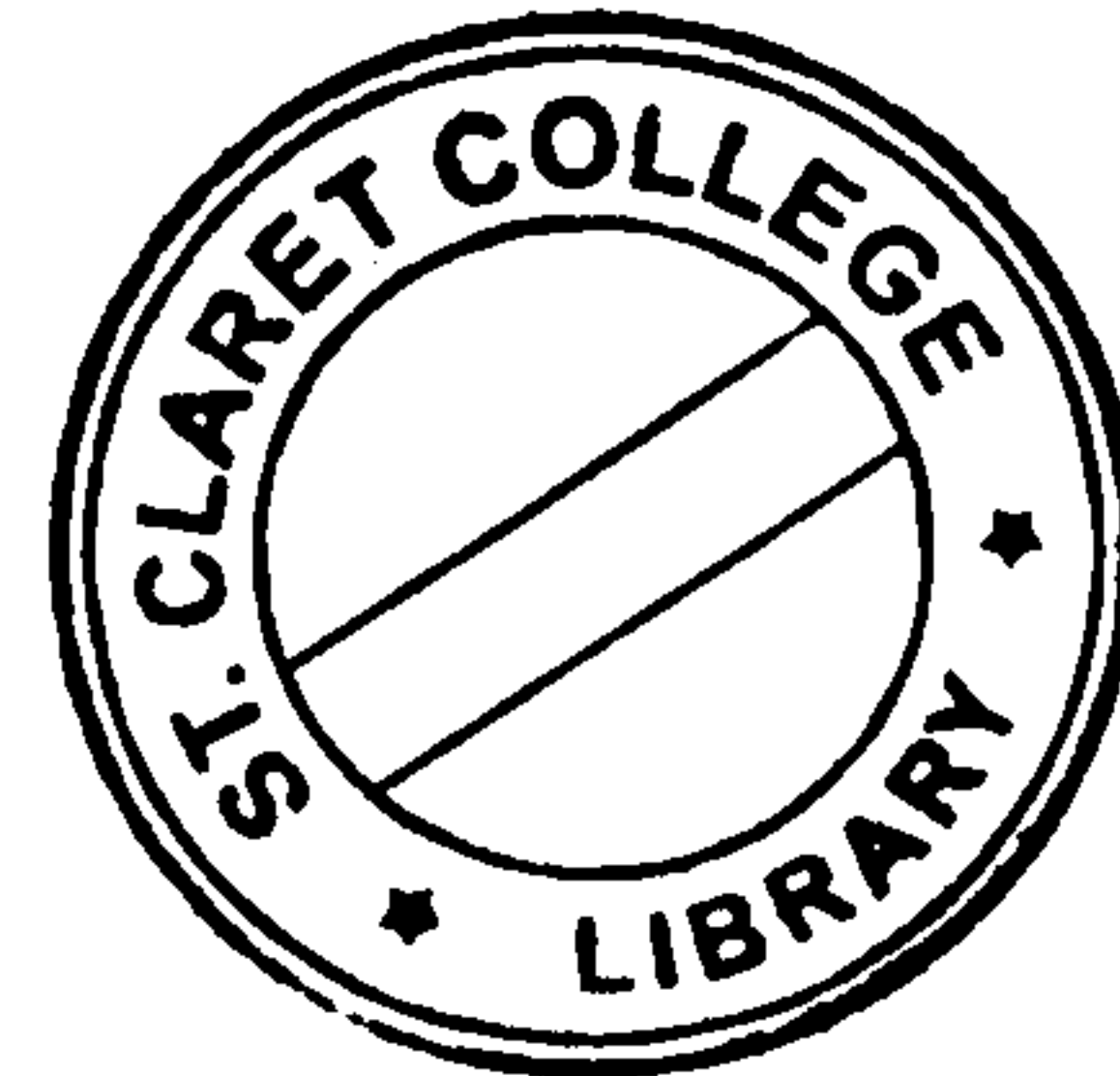
SECTION – A

I. Answer **any ten** of the following.

(2×10=20)

1) Define eigen values and eigen vectors.

2) Solve x if $\begin{pmatrix} x^2 & 1 \\ 2 & x \end{pmatrix} + \begin{pmatrix} 2x & 2 \\ -1 & 2 \end{pmatrix} = \begin{pmatrix} -1 & 3 \\ 1 & 1 \end{pmatrix}$.



3) Define an abelian group.

4) Examine whether $G = \{0, 1, 2\}$ is a group w.r.t. multiplication mod 3.5) Find the unit vector along with the vector $i - 2j - 3k$.6) Find $\vec{i} \times (\vec{a} \times \vec{i})$.7) Find the n^{th} derivative of a^{mx} .

8) State Leibnitz's theorem.

9) Evaluate $\int \tan x \, dx$.



- 10) Evaluate $\int \frac{x^3 + x + 1}{x^2 - 1} \cdot dx$.
- 11) Define an ordinary differential equation with example.
- 12) Solve $x dy + y dx = dx + dy$.
- 13) Find the ratio in which the point $P(5, 4, -6)$ divides the line joining the points $A(3, 2, -4)$ and $B(9, 8, -10)$.
- 14) Find the direction cosine of the line joining the points $P(4, 3, -5)$ and $Q(-2, 1, -8)$.
- 15) The Cartesian equation of the line are $\frac{x-3}{2} = \frac{y+2}{-5} = \frac{z-6}{4}$, find the vector equation of the line.

SECTION – B

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

(5×4=20)

- 16) Solve using Cramer's rule
 $2x - y + z = 6$
 $x + 2y + 3z = 3$
 $3x + y - z = 4$
- 17) Solve using matrix method
 $2x - y + 3z = 9$
 $x + y + z = 6$
 $x - y + z = 2$
- 18) If $A = \begin{pmatrix} 1 & 2 \\ 2 & -1 \end{pmatrix}$, find A^{-2} and A^{-3} .
- 19) Find the n^{th} derivative of $e^{ax} \sin(bx + c)$.
- 20) Find the n^{th} derivative of $\frac{x-1}{(x-2)^3(x+2)}$.
- 21) If $x = \sin(t)$ and $y = \cos(pt)$, prove that
 $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} - (n^2 - p^2)y_n = 0$.



SECTION – C

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

(5×4=20)

- 22) Prove that the set given by $M = \left\{ \begin{pmatrix} x & x \\ x & x \end{pmatrix} / x \in \mathbb{R}, x \neq 0 \right\}$ is an abelian group w.r.t. matrix multiplication.
- 23) P.T., $G = \{1, 5, 7, 11\}$ is a group under multiplication modulo 12.
- 24) P.T., on $\mathbb{Q} - \{0\}$, the operation $*$ defined by $a * b = \frac{ab}{3}$ is a group.
- 25) Using vector method, show that the given points $A(6, -7, -1)$, $B(2, -3, 1)$ and $C(4, -5, 0)$ are collinear.
- 26) Mention any five properties of scalar triple product.
- 27) Find the volume of the parallelepiped whose co-terminal edges are $\vec{a} = i + 2j + 3k$; $\vec{b} = i - 2j + k$; $\vec{c} = 3i + 2j + k$.

SECTION – D

IV. Answer **any four** of the following.

(5×4=20)

- 28) Evaluate $\int \frac{dx}{5 + 4 \cos x}$.
- 29) Evaluate $\int \frac{1}{4x^2 + 4x + 5} dx$.
- 30) Evaluate $\int_1^2 \frac{dx}{\sqrt{2x - x^2}}$.
- 31) Solve $(x^3 - 3xy^2)dx = (y^2 - 3x^2y)dy$.
- 32) Solve $x \frac{dy}{dx} - y = x^3 \cdot \cos x$, $y(\pi) = 0$.
- 33) Solve $x \frac{dy}{dx} + y = y^2 \cdot \log x$.



SECTION – E

V. Answer **any two** of the following.**(5×2=10)**

- 34) Show that the points (1, 2, 3), (2, 3, 1) and (3, 1, 2) are vertices of an equilateral triangle.
- 35) Derive the equation of line in vector form and Cartesian form.
- 36) Show that the line joining the points (1, 2, 3) and (4, 5, 7) is parallel to the line joining the points (– 4, 3, – 6) and (2, 9, 2).
- 37) Show that the points (3, 2, 4), (4, 5, 2) and (5, 8, 0) are collinear and find the equations of the line passing through them.

SECTION – F

VI. Answer **any two** of the following.**(5×2=10)**

- 38) Find the image of the point (– 3, 0, 1) in the plane $4x - 3y + 2z = 19$.
- 39) Let P(3, 2, 0), Q(5, 3, 2), R(– 9, 6, – 3) are three points forming a triangle. PM the bisector of the angle QPR meets QR in M. Find the co-ordinates of the point M.
- 40) Evaluate $\int x^3 \cdot a^x \cdot dx$.
- 41) Evaluate $\int_0^{\pi/2} x \cdot \cos^2 x \cdot dx$.
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