I Semester B.C.A. Examination, November/December 2018
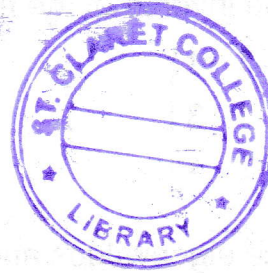### (Y2K8) (Repeaters)
(Equivalent for 1 BCA – 2(OS)/BCA – 101(2K7) and BCA – 303(2K7))
COMPUTER SCIENCE
BCA 203 : Mathematics

Time : 3 Hours   Max. Marks : 90/100

Instructions : 1) Answer **all** Sections.
2) Section **F** is applicable to the students who have taken admission in **2011** and onwards.
3) **100** marks for fresh students **2011** Onwards.
4) **90** marks for repeaters (Prior to **2011-2012**).

SECTION – A

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

1) If $A = \begin{pmatrix} 3 & 2 \\ 1 & 4 \end{pmatrix}$, $B = \begin{pmatrix} -6 & 1 \\ 5 & 6 \end{pmatrix}$, find A + B.

2) Define symmetric matrix with an example.

3) IN a group $G = \{2, 4, 6, 8\}$, $\otimes_{10}$, find identity.

4) Define subgroup.

5) Find the projection of $\vec{a} = i + j + 3k$ on $\vec{b} = i - j - k$.

6) If $\vec{a} = i + 4j + 5k$, $\vec{b} = i - k$, find $\vec{a} \times \vec{b}$.

7) Find the nth derivative of $\operatorname{Sin}^3 x$.

8) If $y = (\operatorname{Sin}^{-1}x)^2$, show that $(1 - x^2)\, y_2 - xy_1 - 2 = 0$.

9) Evaluate : $\int \sqrt{1 + 2x}\; dx$.

10) Evaluate : $\int_0^1 (4x^3 + 3x - 1)\, dx$.

11) Find the order of differential equation $\dfrac{d^2y}{dx^2} = \left[1 + \left(\dfrac{dy}{dx}\right)^2 \right]^{\frac{3}{2}}$.

12) Test the equation for exactness : $(2xy + 3y)\, dx + (x^2 + 3x)\, dy = 0$.

P.T.O.

13) If the direction ratios of a line are (1, 2, 3), find its direction Cosines.

14) Find the equation of a line passing through points (2, –1, 3) and (1, 1, –2).

15) Find the angle between the lines whose direction ratios are (2, 3, 4) and (1, –2, 1).

SECTION – B

II. Answer **any four** of the following :   **(4×5=20)**

16) Solve by Cramer's rule

$$3x - y + 2z = 13$$
$$2x + y - z = 3$$
$$x + 3y - 5z = -8.$$

17) Find the inverse of the matrix

$$\begin{pmatrix} 1 & -1 & 1 \\ 2 & -1 & 3 \\ -3 & -2 & 4 \end{pmatrix}.$$

18) Find the eigenvalues and the corresponding eigenvectors of $A = \begin{pmatrix} 5 & 4 \\ 1 & 2 \end{pmatrix}.$

19) Find the nth derivative of $Cos(ax + b)$.

20) Find $\dfrac{d^n}{dx^n}\left[\dfrac{1}{(x-2)(x+3)}\right].$

21) If $y = e^m \sin^{-1}x$, prove that $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} - (n^2 + m^2)y_n = 0.$

SECTION – C

III. Answer **any four** of the following :   **(4×5=20)**

22) Prove that G = {1, –1, i, –i} forms an abelian group under multiplication.

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

24) Show that the set of even integers is a subgroup of additive group of integers.

25) Find the unit vector perpendicular to both vectors 4i + j – k and i + j + 3k.

26) If the vectors 4i + 11j + mk, 7i + 2j + 6k and i + 5j + 4k are Coplanar, find m.

27) Find the unit vector Coplanar with $\vec{b}$ and $\vec{c}$, but perpendicular to $\vec{a}$, where $\vec{a} = i - 2j + k$, $\vec{b} = 2i + j + k$ and $\vec{c} = i + 2j - k.$

SECTION – D

IV. Answer **any four** of the following : (4×5=20)

28) Evaluate : $\int \dfrac{x\,dx}{(x+1)(x+2)}$.

29) Evaluate : $\int \dfrac{dx}{5+3\cos x}$.

30) Prove that $\displaystyle\int_{0}^{\frac{\pi}{2}} \dfrac{\sin^3 x\,dx}{\sin^3 x + \cos^3 x} = \dfrac{\pi}{4}$.

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

32) Solve : $\dfrac{dy}{dx} + \dfrac{2}{x}y = x^3$.

33) Solve : $\dfrac{dy}{dx} = \dfrac{x+2y}{x-y}$.

SECTION – E

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

34) The Centroid of the triangle is (2, 1, −1). If the co-ordinates of two of its vertices are (1, 2, −1) and (2, 0, 3). Find the co-ordinates of the third vertex.

35) Find the angle between the two diagonals of a Cube.

36) Find the point of intersection of lines $\dfrac{x-1}{-3} = \dfrac{y-2}{2} = \dfrac{z-3}{2}$ and $\dfrac{x-1}{3} = \dfrac{y-5}{1} = \dfrac{z}{-5}$.

37) Find the image of the point (2, −1, 2) in the plane $2x + y + z = 6$.

SECTION – F

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

38) Find the angle between two lines whose direction cosines are given by equations $2l - m + 2n = 0$ and $mn + nl + lm = 0$.

39) Find a unit vector normal to plane $\vec{r} \cdot (2i - 3j + 6k) + 14 = 0$.

40) Evaluate : $\displaystyle\int_{0}^{\pi} \sin 2x \cos 3x\,dx$.

41) Evaluate : $\int \cos^{-1} x\,dx$.