SA – 911

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II Semester B.C.A. Degree Examination, April/May 2015
(Y2K8 Scheme)
COMPUTER SCIENCE
BCA – 203 : Mathematics
(R 100- 2011-12 and Onwards, R – 90-Prior to 2011-12)

Time : 3 Hours Max. Marks : 100/90

Instructions : *1) Section **A, B, C, D** and **E** is common to **all** students.*
*2) Section **F** is aplicable to the student **2011-12** onwards.*

SECTION – A

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

1) Define eigen values and eigen vectors.

2) Find x, if $\begin{vmatrix} x & 3 & -2 \\ 3 & -2 & 5 \\ 0 & 1 & 2 \end{vmatrix} = 0.$

3) Define a semi group with example.

4) In a group of rational numbers $*$ is defined by $a * b = a + b - ab$. Find the identity and inverse.

5) If $\vec{a} = i - 2j + 3k$ and $\vec{b} = 2i - j - 3k$, Find the projection of $\vec{a}$ on $\vec{b}$.

6) If $\vec{a} = 3i - j + 3k$ and $\vec{b} = 3i + 2j - k$ Find $\left|\vec{a} + 3\vec{b}\right|$.

7) Find the nth derivative of $e^{3x}.\sin 2x$.

8) Find the nth derivative of $\sin 3x \cos x$.

9) Evaluate $\int \log x.dx$.

10) Evaluate $\int \frac{dx}{(x+1)(x+3)}$.

P.T.O.

11) Write the order and degree of the differential equation

$$\left(\frac{d^3y}{dx^3}\right)^3 + \left(\frac{d^2y}{dx^2}\right)^5 + \frac{dy}{dx} + y = e^x.$$

12) Solve $\frac{dy}{dx} + \frac{4y+3}{2x+1} = 0$.

13) Find the distance between the points (3, 4, –2) and (– 4, 2, 5).

14) Find the direction cosine of the vector 3i + 4j + k.

15) Find the centroid of a triangle with vertices (3, –2, 4), (5, – 4, 5) and (1, 4, 2).

SECTION – B

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

16) Find the angle between diagonals of a cube.

17) Solve x + y – 2z = 0, 2x – y + z = 2, x + 2y – z = 2 by matrix method.

18) Using the Cayley-Hamilton theorem find the inverse of the matrix

$$A = \begin{bmatrix} -5 & 4 \\ -2 & 1 \end{bmatrix}.$$

19) Find the nth derivative of $e^{ax}\sin(bx + c)$.

20) Find the nth derivative of $\frac{x+3}{(x+1)(2x+3)}$.

21) If $y = \sin(m\sin^{-1}x)$, then 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 = {2, 4, 6, 8} is a group under multiplication modulo 10.

23) Prove that $G = \{1, W, W^2\}$ forms an Abelian group under multiplication.

24) Prove that H = {1, –1} is a sub group of G = {1, –1, i, –i} under multiplication.

25) Find the area of the parallelogram whose diagonals are 4i + 2j – k and 3i + j + 4k.

26) Prove that points A(2, 3, –1) B(1, –2, 3) C(3, 4, –2) and D(1, –6, 6) are coplanar.

27) If $\vec{a} = 3i + 2j - 3k$, $\vec{b} = i + 2j - k$ and $\vec{c} = i - 2j + 4k$. Find $\vec{a} \times (\vec{b} \times \vec{c})$.

SECTION – D

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

28) Evaluate $\int \frac{dx}{2x^2 + 4x + 9}$.

29) Evaluate $\int x \cos 2x \, dx$.

30) Evaluate $\int_0^{\pi/2} \frac{\cos^6 x}{\cos^6 x + \sin^6 x} dx$.

31) Solve $\frac{dy}{dx} = \cos(x + y)$.

32) Solve $(x^2 + 2y^2)\, dx - xy\,dy = 0$.

33) Verify the equation $(4x + 3y + 1)\, dx + (3x + 2y + 1)\, dy = 0$ for exactness and hence solve.

SECTION – E

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

34) Find the angle between the lines whose direction ratios are 1, –1, 2 and 1, 0, –3.

35) Find the equation of the plane passing through (1, 1, 1) (1, –1, 1) and (–7, –3, –5).

36) Show that the points (1, 2, 3) and (–3, –1, –1) (5, 5, 7) are collinear. Also find the equation of the line through these points.

37) Find the length and equation of the shortest distance between the z-axis and the line $\frac{x+1}{3} = \frac{y-2}{4} = \frac{z}{5}$.

SECTION – F

(Section F is aplicable to the Student 2011-12 Onwards)

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

38) Find the equation of the sphere which passes through the circle $x^2 + y^2 + z^2 - 9 = 0 = 2x + 3y + 4z - 5$ and the point (1, 2, 3).

39) Find the equation of the right circular core whose axis $\frac{x-1}{-1} = \frac{y-2}{3} = \frac{z-3}{3}$ and a generator is $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$.

40) Evaluate $\int \frac{dx}{4\cos x + 3\sin x + 5}$.

41) Mention any 5 properties of scalar triple product.