SS – 678

I Semester B.C.A. Degree Examination, November/December 2018
(F+R) (CBCS) (2014-15 and Onwards)
COMPUTER SCIENCE
BCA 105 T : Discrete Mathematics

Time : 3 Hours Max. Marks : 100

***Instruction** : Answer **all** Sections.*

SECTION – A

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

1) If A = {c, d, e} and B = {a, b} find B × A.
2) Define an equivalence relation.
3) Define diagonal matrix with example.
4) Construct the truth table for $\sim p \rightarrow q$.
5) If $A = \begin{bmatrix} 1 & -3 \\ 2 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -1 \\ 0 & 3 \end{bmatrix}$ find A + 3B.
6) Find the characteristic root of the matrix $A = \begin{bmatrix} 3 & 0 \\ 5 & 2 \end{bmatrix}$.
7) If $\log_2^{64} = x$, then find x.
8) If ${}^nC_{8} = {}^nC_2$ find ${}^nC_2$.
9) Define abelian group.
10) If $\vec{a} = 2\hat{i} + \hat{j} - 3\hat{k}$ and $\vec{b} = 5\hat{i} + \hat{j} + 4\hat{k}$ find $\left|\vec{a} + \vec{b}\right|$.
11) Find the distance between the points A(3, – 1) and B(4, –2).
12) Find the equation of the line with slope 3 and cutting off an intercept 2 on y-axis.

SECTION – B

II. Answer **any six** of the following : **(6×5=30)**

13) If A = {1, 2, 3, 4} B = {3, 4, 5} and C = {3, 5, 6, 7} then verify
$A \times (B \cup C) = \{A \times B\} \cup \{A \times C\}$
14) If f : R → R is defined f(x) = 7x – 8 prove that f is invertible and find f^{-1}.

P.T.O.

15) Prove that $(\sim q \rightarrow \sim p) \leftrightarrow (p \rightarrow q)$ is a tautology.

16) Verify whether $(p \wedge \sim q) \wedge (\sim p \vee q)$ is a contradiction or not.

17) Prove that $\left[p \wedge (q \vee r)\right] \equiv \left[(p \wedge q) \vee (p \wedge r)\right]$.

18) Find the inverse of the matrix $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$.

19) Solve $2x + 3y + z = 9$, $4x + y = 7$ and $x - 3y - 7z = 6$ using Cramer's rule.

20) State and verify the Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 3 & 2 \\ 4 & 5 \end{bmatrix}$.

SECTION – C

III. Answer **any six** questions : **(6×5=30)**

21) If $x = \log_{2a}^{a}$, $y = \log_{3a}^{2a}$, $z = \log_{4a}^{3a}$ then prove that $1 + xyz = 2yz$.

22) i) If $\frac{1}{9!} + \frac{1}{10!} = \frac{x}{11!}$ find x.

ii) Find n if $2(np_3) = np_5$.

23) Prove that G = {2, 4, 6, 8} is an abelian group under multiplication modulo 10.

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

25) If $\vec{a} = i + 2j - 3k$, $\vec{b} = 2i - j - 4k$ find $(\vec{a} + \vec{b}) \cdot (4\vec{a} + 3\vec{b})$.

26) Find the area of the triangle whose vertices are A (1, 3, 2) B (–1, 4, –1) and (–2, 3, –5) using vector method.

27) If the vectors $\vec{a} = 3i - 4j + mk$, $3i + j - k$ and $\vec{c} = 2i - 2j + 4k$ are coplanar find m.

28) In how many different ways can be the letters of word "MISSISSIPPI" be arranged. In how many of these arrangements do the four I's not come together ?

SECTION – D

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

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

30) The three vertices of a rhombus taken in order are (2, –1), (3, 4) (–2, 3). Find the fourth vertex.

31) Find the equation to the perpendicular bisector of the line joining the points (–1, 5) and (2, 4).

32) Derive the equation of the straight line whose x-intercept is 'a' and y-intercept is 'b'.

33) Find the value of k if the lines

i) $3x + 2y + 1 = 0$ and $kx + 2y - 1 = 0$ are parallel

ii) $5x - 4y + 8 = 0$ and $4x + ky + 3 = 0$ are perpendicular.

34) Find the equation of the straight line which is passing through the intersection of the lines $2x - 3y - 4 = 0$ and $2x + 2y - 1 = 0$ and perpendicular to the line $x + 4y - 8 = 0$.