BRAINWARE UNIVERSITY

Term End Examination 2018 - 19

Programme – B.Sc.(CS)

Course Name – Mathematics-I

Course Code - BCS103

(Semester – 1)

Time allotted: 3 Hours **Full Marks : 70**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group –A

(Multiple Choice Type Question) 10 x 1 = 10

1. ***Choose the correct alternative from the following:***

(i) If A and B are two sets such that AUB= A ∩ B, then

a. A = Φ b. B = Φ

c. A = B d. none of these

(ii) Let N be the set of natural numbers and R be the relation in N defined as R = {(a, b) : a = b – 2, b > 6}. Then

a. (2, 4) ∈ R b. (8, 7) ∈ R

c. (3, 8) ∈ R d. (6, 8) ∈ R

(iii) If A and B are non-singular square matrices, then $(AB)^{-1}$=

a. $A^{-1} B^{-1}$ b. AB^{-1}

c. $A^{-1} B$ d. $B^{-1} A^{-1}$

(iv) Trace of a square null matrix is

a. 1 b. 0

c. ∞ d. None of these

(v) The statement p and q $\sim(p \vee q)$ implies

a. $\sim p \wedge \sim q$ b. $\sim p \vee \sim q$

c. $(p \vee q)$ d. None of these

(vi) Contrapositive of $"\sim p \rightarrow q"$ is

a. $p \rightarrow q$ b. $\sim q \rightarrow \sim p$
c. $\sim q \rightarrow p$ d. $q \rightarrow \sim p$

(vii) The possible number of vertices in a binary tree is

a. 4 b. 6
c. 5 d. 2

(viii) A minimally connected graph is a

a. Binary tree b. Hamiltonian graph
c. Tree d. Regular graph

(ix) A null graph with n vertices is

a. 1-chromatic b. (n-1)-chromatic
c. n-chromatic d. (n+ 1)-chromatic

(x) If C_{97} be a circuit with 97 number of vertices, then $\chi(C_{97})$ is

a. 97 b. 98
c. 2 d. 3

Group – B

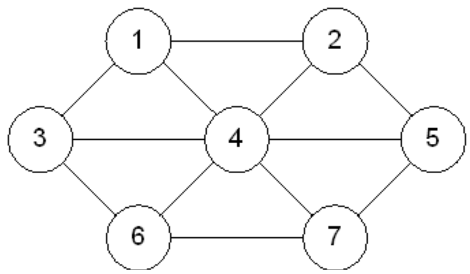
(Short Answer Type Questions) 3 x 5 = 15

Answer any *three* from the following :

2. If $A^{-1} = \begin{pmatrix} 1 & 0 & 1 \\ 3 & 4 & 5 \\ 2 & 3 & 4 \end{pmatrix}$,find A. 5

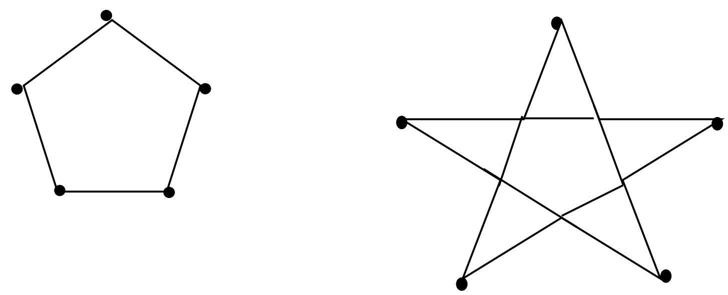
3. Draw the graph from the matrix $\begin{bmatrix} 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 \end{bmatrix}$. 5

4. Define Adjacency Matrix for a non-directed graph. Hence find the adjacency matrix for the following graph



5

5. Define Isomorphic graph. Examine whether the following graphs are isomorphic or not?



2+3

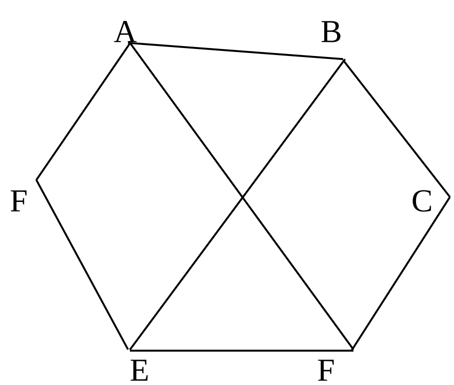
6. Show that $(p \to (q \to r)) \to ((p \to q) \to (p \to r))$ is a contradiction. 5

Group – C

(Long Answer Type Questions) 3 x 15 = 45

Answer any *three* from the following :

7. (a) Find the chromatic number of the following graph. Find whether this graph is perfect.

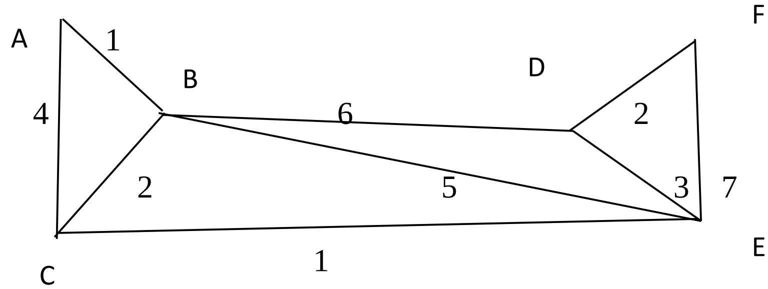


6

(b) Prove that a tree with n vertices has n-1 edges. 4

(c) Show that formula A: $(p \to q) \vee (\mathrm{p} \to \mathrm{r})$ is logically equivalent to the formula B: $\mathrm{p} \to (\mathrm{q} \vee \mathrm{r})$. 5

8. (a) Using Dijkstra's Algorithm find the length of the shortest path of the following graph from the vertex A to F:

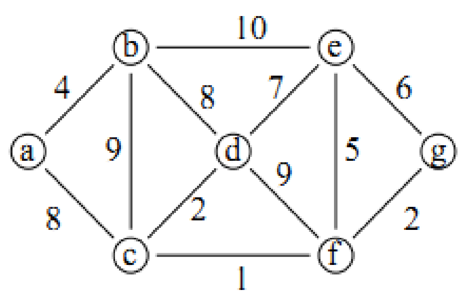


8

(b) Solve the recurrence relation
$a_n - 5a_{n-1} + 6a_{n-2} = 2^n + n$, $n \geq 2$ with the boundary condition $a_0 = 1, a_1 = 1$

7

9. (a) Use Kruskal's Algorithm and Prim's algorithm find the minimal spanning tree and the corresponding weight of the spanning tree in the following graph:



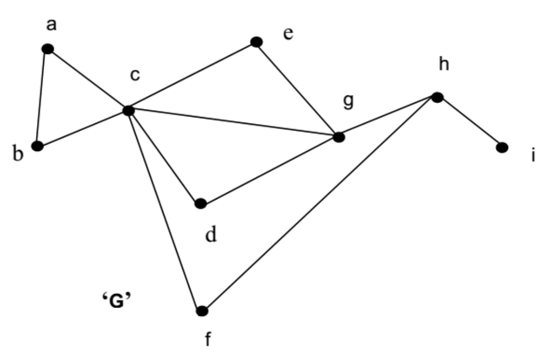
5+5

(b) Show that the statement formula A logically implies statement formula B

$A:(q \rightarrow (p \wedge \sim p)) \rightarrow (r \rightarrow (p \wedge \sim p))$, $B:(r \rightarrow q)$ 5

10. (a) Prove that for a complete graph with n number of vertices, the number of edges is exactly $\dfrac{n(n-1)}{2}$ 5

(b) Construct a spanning tree of the following graph G by BFS and DFS:



5

(c) Show that $(p \wedge q) \vee (q \wedge r) \vee (p \wedge r)$ is a contingency. 5

11. (a) Using Principle of inclusion and exclusion show that for any three sets A, B and C: $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(A \cap C) + n(A \cap B \cap C)$ 6

(b) Find the inverse of the matrix:

$$A = \begin{pmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{pmatrix}$$

5

(c) A graph with at least one edge is 2- chromatic iff it has no circuit of odd length. 4
