BRAINWARE UNIVERSITY

Course – BCA

Mathematics-II (BCA204/ BCAC204)

(Semester – 2)

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 Questions)   10 x 1 = 10

1.   *Choose the correct alternative from the following:*
(i)   Degree of an isolated vertex is:

     a. 1   b. 2

     c. 3   d. 0

(ii)   Number of edges in a complete graph with n-vertices is:

     a. $^{n}C_{1}$ b. $^{n}C_{2}$

     c. $^{n}C_{3}$ d. $^{n}C_{n}$

(iii)   If G is a tree with n vertices, then the number of edges of G are

     a. n(n+1)   b. n-1

     c. n   d. n(n-1)

(iv)   Every vertex of a null graph is

     a. Pendant   b. Isolated

     c. Odd   d. None of these

(v)   If the graph has 6 vertices and 15 edges then the size of its adjacency matrix is

     a. 6X6   b. 6X15

     c. 15X6   d. 15X15

(vi)   Chromatic number of a complete graph with 15 number of vertices is

     a. 12   b. 13

     c. 14   d. 15

(vii) The mode of the given frequency distribution is

x_i	0	1	2	3
f_i	9	26	27	22

     a. 0   b. 1

     c. 2   d. 3

(viii) The A.M of $2, 4, 6, \ldots\ldots 2n$ is

     a. n+1   b. n(n+1)

     c. (n+1)/2   d. n(n+1)/2

(ix) Condition for independence of two events A and B is

     a. $P(A \cap B) = P(A).P(B)$ b. $P(A + B) = P(A).P(B)$

     c. $P(A - B) = P(A).P(B)$ d. $P(A \cap B) = P(A).P(B / A)$

(x) If $P(A + B) = \dfrac{2}{7}$ then the probability of $P(\quad)$ is

     a. $\dfrac{1}{7}$ b. $\dfrac{2}{7}$

     c. $\dfrac{5}{7}$ d. None of these

Group – B

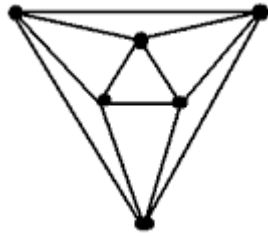<div align="center">(Short Answer Type Questions)   3 x 5 = 15</div>

Answer any *three* from the following:

2. Prove that the number of odd vertices in a graph is even.   [5]

3. Define Adjacency Matrix for a non-directed graph. Hence find the adjacency matrix for the following graph:
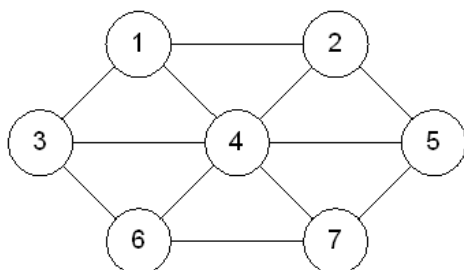
     [5]

4. Draw the dual of the following graph:

[5]

5. In the following frequency distribution mean is 4.44 but the distribution table is incomplete with two frequencies missing. Find the two missing frequencies.

x_i	2	3	5	6	7	8	Total
f_i	9	12	?	10	?	1	50

[5]

6. If A and B are two events associated with the same experiment E, then prove that $P(A+B)=P(A)+P(B)-P(AB)$

[5]

Group – C

(Long Answer Type Questions)   3 x 15 = 45

Answer any *three* from the following:

7. (a) Prove that, a simple graph with n number of vertices and k number of components can have maximum $\dfrac{(n-k)(n-k+1)}{2}$ number of edges.

[7]

(b) Calculate the mean, median, Q_1 and Q_3 from the following frequency distribution where Q_1 and Q_3 have their usual meaning:

Class interval	5-10	10-15	15-20	20-25	25-30	30-35
Frequency	2	3	4	5	7	9

[2+2+2+2]

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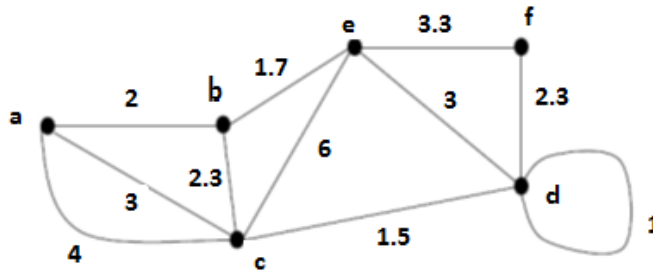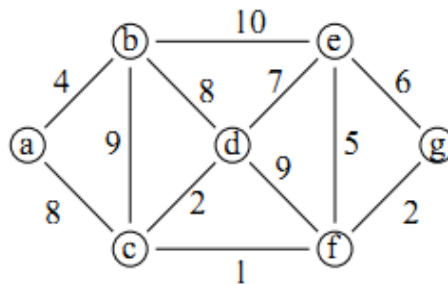

[8]

(b) If two groups of n_1 and n_2 observations have the mean and standard deviation $\bar{x}_1$ and s_1 and $\bar{x}_2$ and s_2 respectively, then show that the S.D.(s) of the composite group is given by

$$(n_1 + n_2)s^2 = (n_1 s_1^2 + n_2 s_2^2) + n_1 d_1^2 + n_2 d_2^2$$

where $d_1 = \bar{x}_1 - \bar{x}$, $d_2 = \bar{x}_2 - \bar{x}$ and $\bar{x}$ is the mean of the composite group. [7]

9. (a) Find a minimal spanning tree from the following graph using Prim's algorithm:

[8]

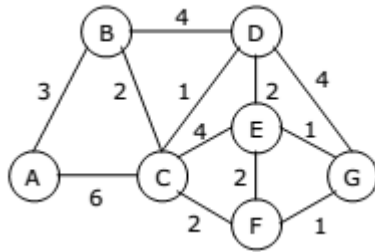(b) If A and B are independent events, then show that the following pairs are independent :

    (i) $\bar{A}$ and $\bar{B}$

    (ii) A and $\bar{B}$

    (iii) $\bar{A}$ and B

[3+2+2]

10. (a) Apply Kruskal's algorithm to find a shortest spanning tree of the following graph

[8]

(b) Find the relation between the arithmetic mean, geometric mean and harmonic mean. [7]

11. (a) Draw a Graph with four edges and four vertices having degrees 2,2,3,3 if it possible. If not find the reason? [2]

(b) How many vertices are necessary to construct a graph with exactly 12 edges in which each vertex is of degree 3? [2]

(c) Find two spanning trees of the following connected graph applying DFS and BFS algorithms:
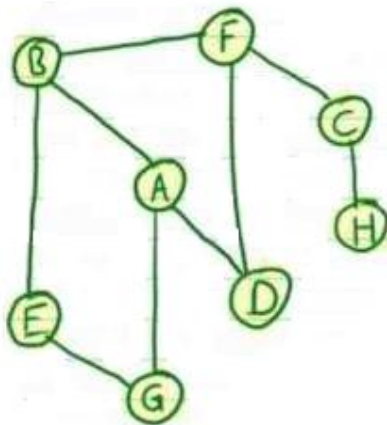
[6]

(d) In a bolt factory, machines A, B and C manufacture respectively 25%, 35% and 40%of the total output .Of their output 5%, 4% and 2% are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability that it was manufactured by machine C? [5]