BRAINWARE UNIVERSITY

Course –BSc.(HN)

Mathematics-II (BHN303)

(Semester –3)

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)   A vertex of degree 1 is called

    a. Isolated vertex   b. Pendant vertex

    c. Even vertex   d. none of these

(ii) If a path is considered as a sub graph then the degree of the intermediate vertices is

    a. 0   b. 1

    c. 2   d. 3

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

    a. 6X15   b. 15X6

    c. 6X6   d. 15X15

(iv) If G is a binary tree with 11 vertices, then the number of pendant vertex of G are

    a. 3   b. 4

    c. 5   d. 6

(v)   If an edge of a tree is deleted then it becomes

    a. disconnected   b. binary tree

    c. spanning sub graph   d. none of these

(vi) If P(A)=0.2 , P(B)=0.4 ,P(A+B)=0.6, then the events A,B are

    a. independent   b. mutually exhaustive

    c. mutually exclusive   d. none of these

(vii)   The probability of obtaining an even number in the throw of a fair dice is

     a. $\dfrac{1}{2}$ b. $\dfrac{1}{3}$

     c. $\dfrac{1}{4}$ d.   None of these

(viii)   The mode of the frequency distribution :

x	2	4	6	8
f	25	21	19	30

     a.   2   b.   4

     c.   6   d.   8

(ix)   The chance that a leap year selected at random will contain 53 Wednesdays is

     a. $\dfrac{2}{7}$ b.   0

     c.   1   d. $\dfrac{5}{6}$

(x)   If var(x)=2 then var (5x+2)=

     a.   5   b.   25

     c.   125   d.   None of these

Group – B

(Short Answer Type Questions)   3 x 5 = 15

Answer any *three* from the following

2.   Prove that for any two events A, B

    i) $P(A+\bar{B})=1-P(B)+P(AB)$

     ii) $P(A\,\bar{B})=P(A)-P(AB)$ [3+2]

3.   Draw a neat diagram of a histogram and a frequency polygon of the following table

Marks	31-30	31-40	41-50	51-60	61-70	71-80	81-90
No of students	15	28	30	27	22	15	8

                                                               [5]

4.   State 'Handshaking Lemma' for a graph. Prove that for a simple graph with n number of vertices the degree of each vertex is maximum (n-1).

                                                               [5]

5.   Define the following terms:
       i)   Complete Graph
       ii) Planer Graph
       iii) Regular graph
       iv) Dual Graph
       v)   Null Graph

                                                          [1+1+1+1+1]

6.   Prove that the S.D of the two variate values x_1 and x_2 is equal to the half of their absolute difference   [5]
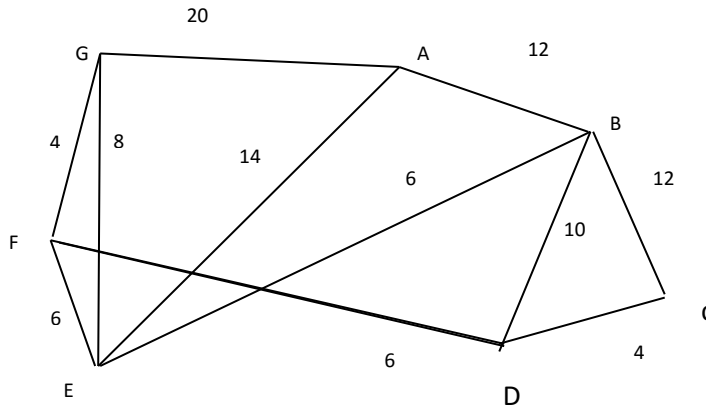
Group – C

(Long Answer Type Questions)   3x 15= 45

Answer any *three* from the following

7. (a) Prove that for a 'p-regular' graph with n number of vertices, the number of edges should be exactly $\frac{np}{2}$.   [4]

   (b) Find the minimal spanning tree from the following graph using prim's algorithm.

[6]

   (c) Find the mean and S.D of the first n natural numbers

[5]

8. (a) A bag contains 5 white and 4 black balls. If 3 balls are drawn at random, what are the probabilities of the following:
   i) 2 of them are white
   ii) At least two are white.   [5]

   (b) Prove that no of internal vertices in a binary tree is one less than the number of pendant vertices   [5]

   (c) Prove that standard deviation is independent of the shift of origin and depends only on the change of scale   [5]

9. (a) Applying Dijkstra's method to find the shortest path and distance between the two vertices **a** & **z** in the given graph

[7]
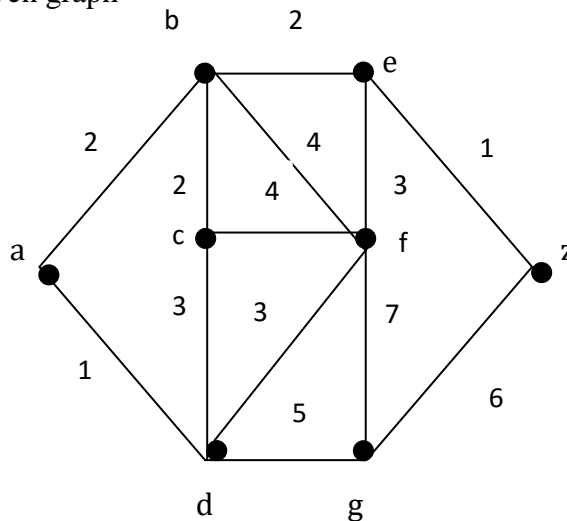
(b) Calculate the mean,median of the frequency distribution given below.Hence calculate the mode using the empirical relation between the three

Class limit	130-134	135-139	140-144	145-149	150-154	155-159	160-164
Frequency	5	15	28	24	17	10	1

[8]

10. (a) The expenditure of 1000 families is given below :

Expenditure(Rs)	40-59	60-79	80-99	100-119	120-139
No of families	50	f_1	500	f_2	50

The median and mean for the distribution are both Rs. 87.50.Calculate the missing frequencies. [6]

(b) If two group of n_1 and n_2 observation 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. [5]

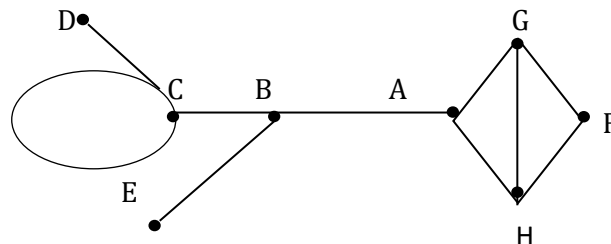(c) Define adjacency matrix for a non-directed graph. Determine the adjacency matrix of the given digraph:
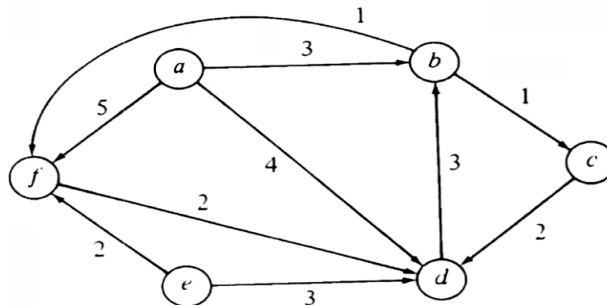
[4]

11. (a) "A graph is a Tree if and only if there is one and only one path between any two vertices" - justify. [5]

(b) Find the spanning tree of the connected graph applying DFS and BFS.

[5]

(c) 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]