# B.M.S. College of Engineering, Bengaluru-560019

**Autonomous Institute Affiliated to VTU**

## April 2023 Semester End Main Examinations

**Programme: B.E.**                                         **Semester: III**

**Branch: CSE/ISE**                                         **Duration: 3 hrs.**

**Course Code: 22MA3BSSDM**                                 **Max Marks: 100**

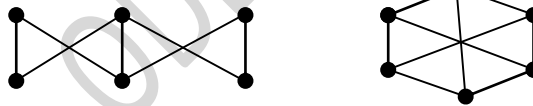**Course: Statistics and Discrete Mathematics**            **Date: 10.04.2023**

**Instructions**: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.
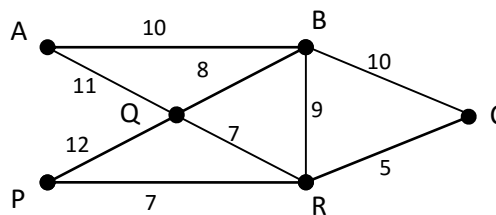3. Use of Statistical tables is permitted.

### UNIT - I

1   a) Determine |V| for the following graphs.                                       **6**
    i)   G has nine edges and all vertices have degree 3.
    ii)  G is regular with 15 edges.

b) Define isomorphism of two graphs. Determine whether the two graphs given below are isomorphic or not.     **7**



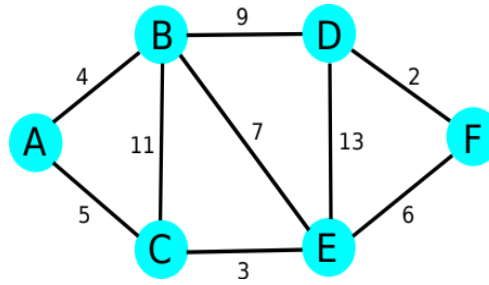c) Apply Kruskal's algorithm to find a minimal spanning tree for the weighted graph shown below.     **7**



### OR

2   a) Prove that a connected graph G remains connected after removing an edge $e$ from G if and only if $e$ is a part of some cycle in G.     **6**

b) Obtain the incidence matrix for the graph whose adjacency matrix is given below.     **7**

$$X(G) = \begin{array}{c} a \\ b \\ c \\ d \\ e \end{array} \begin{array}{ccccc} a & b & c & d & e \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 1 & 1 & 0 \end{bmatrix}$$

c) Apply Dijkstra's algorithm to obtain the shortest path from vertex *A* to each of the other vertices in the weighted, directed network shown below. **7**



**UNIT - II**

3 a) Find the coefficient of **6**
   i) $x^9 y^3$ in the expansion of $(2x - 3y)^{12}$.
   ii) $a^2 b^3 c^2 d^5$ in the expansion of $(a + 2b - 3c + 2d + 5)^{16}$.

b) In how many ways can the 26 letters of the English alphabet be permuted so that none of the patterns CAR, DOG, PUN or BYTE occurs? **7**

c) By using the expansion formula, find the rook polynomial for the labelled board shown below. **7**

| 1 | 2 | 3 |
|---|---|---|
| 4 |   | 5 |
| 6 | 7 | 8 |

**UNIT - III**

4 a) If *P* is the pull required to lift a load *W* by means of a pulley block, find a linear law of the form $P = mW + c$ connecting *P* and *W* for the following data: **6**

| P | 12 | 15 | 21 | 25 |
|---|----|----|-----|-----|
| W | 50 | 70 | 100 | 120 |

where *P* and *W* are taken in kg. Compute *P* when *W*=150 kg.

b) Obtain the regression lines and hence find the coefficient of correlation for the following data: **7**

| x | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|----|----|----|----|----|----|----|
| y | 10 | 12 | 16 | 28 | 25 | 36 | 41 |

c) In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution. **7**

## UNIT - IV

5  a)  In a random sample of 100 tube lights produced by company *A*, the mean lifetime (mlt) of tube light is 1190 hours with standard deviation of 90 hours. Also, in a random sample of 75 tube lights from company *B* the mean lifetime is 1230 hours with standard deviation of 120 hours. Is there a difference between the mean lifetimes of the two brands of tube lights at a significance level of 0.05?   6

   b)  A certain stimulus administered to each of the 12 patients resulted in the following change in blood pressure: 5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0 and 4. Can it be concluded that the stimulus will increase the blood pressure?

   c)  According to a theory in genetics, the proportion of beans of four types *A, B, C* and *D* in a generation should be 9:3:3:1. In an experiment, among 1600 beans, the frequency of beans of each of the above four types were 882, 313, 287 and 118 respectively. Does the result support the theory?   7

### OR

6  a)  Two samples of sizes 9 and 8 give the sum of squares of deviations from their respective means is equal to 160 inches$^2$ and 91 inches$^2$ respectively. Can these be regarded as drawn from the normal population with equal variances?   6

   b)  A company claims that the mean thermal efficiency of diesel engines produced by them is 32.3. To test this claim, a random sample of 40 engines were examined which showed the mean thermal efficiency of 31.4 and standard deviation of 1.6. Can the claim be accepted or not at 0.01 level of significance?   7

   c)  A random sample of specimens of coal from two mines A and B were drawn and their heat producing capacity (in millions of calories/ton) were measured yielding the following results:   7

| Mine A | 8350 | 8070 | 8340 | 8130 | 8260 | -    |
| Mine B | 7900 | 8140 | 7920 | 7840 | 7890 | 7950 |

   Is there a significant difference between the means of these two samples at 1% level of significance?

## UNIT - V

7  a)  Solve the linear congruence equation $9x \equiv 21 (mod\ 30)$.   6

   b)  Solve the system of linear congruences $x \equiv 2(mod\ 3),\ x \equiv 3(mod\ 5)$ and $x \equiv 2(mod\ 7)$.   7

   c)  Apply Fermat's Little theorem to find the remainder when $24^{1947}$ is divided by 17.   7

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