[Total No. of Questions - 9] [Total No. of Printed Pages - 3]

DEC-23-1242

MCA-6104 (Discrete Mathematical Structures)

MCA-1st CBCS/NEP

Time : 3 Hours **Max. Marks : 60**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note: Attempt five questions in all by selecting one question each from section A, B, C and D. Section-E is compulsory.

SECTION-A (12)

1. Check the validity of following argument using rules of inference;

   "If interest rates drop, the housing market will improve. Either the federal discount rate will drop or the housing market will not improve. Interest rates will drop. Therefore, the federal discount rate will drop."

2. Determine whether each of the below mentioned functions from $\mathbb{Z}$ to $\mathbb{Z}$ is one-to-one or not:

   a. $f(n) = |n|$

   b. $f(n) = [n/2]$

SECTION - B (12)

3. The probability that a married man watches a certain television show is 0.4, and the probability that a married woman watches the show is 0.5. The probability that a man watches the show, given that his wife does, is 0.7. Find the probability that;

   a. A wife watches the show, given that her husband does.

   b. At least one member of a married couple will watch the show.

4. The number of virus affected files (initially) in a system is 1000 and this increases 250% every two hours. Form a recurrence relation and solve it by the generating function. Determine the number of virus affected files in the system after one day.

SECTION - C (12)

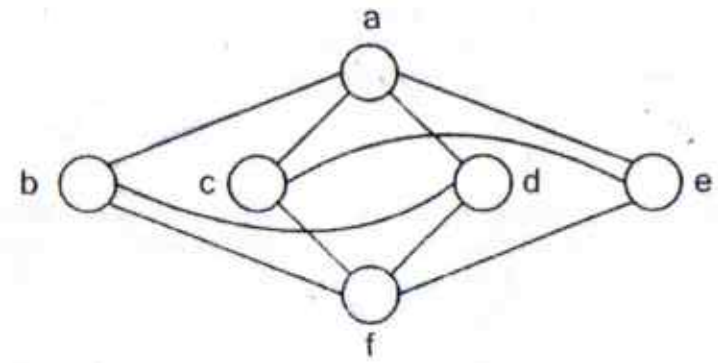
5. For which values of m and n does the complete bipartite graph $K_{m,n}$ have an

   a. Euler circuit?

   b. Hamiltonian circuit?

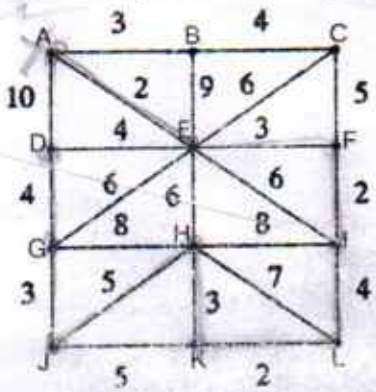
6. A University offers 6 courses as mentioned by the following graph. Edge represents that the two subjects can be studied simultaneously by a student. How many minimum exam slots should the University keep such that no student misses any exam?

   (Use Graph Colouring technique)



SECTION-D (12)

7. A pipeline is to be built that will link twelve cities. The cost (in $100 millions) of constructing each potential link depends on distance and terrain and is shown in the weighted graph below. Find a system of pipelines to connect all the cities and yet minimize the total cost by the Prim's algorithm.



8. Check if $F = (\mathbb{R}^+, +, \cdot)$ is a field or not. If not, mention the property it fails to satisfy.

SECTION - E (6×2=12)

9. a. Let N (x) be the statement "x has visited Dubai," where the domain consists of the students in your school. Express the quantification, $\neg\forall x\, N(x)$ in English.

   b. Let $A = \{a, b, c, d\}$ and $B = \{y, z\}$. Find the cartesian product, $B \times A$.

   c. Using Pigeonhole principle, determine how many students must be in a class to guarantee that at least two students receive the same score on the final exam, if the exam is graded on a scale from 0 to 100 points?

   d. Explain principle of Mathematical Induction.

   e. Define a rooted tree with an example.

   f. Define Integral Domain with an example.