Jaypee Institute of Information Technology, Noida
Test-III (B.Tech. II Semester)

Course Name: Discrete Mathematics **Max. Marks: 35**
Course Code: 10B11MA211 **Max. Time: 2 Hrs.**

Note: Attempt all questions.

1. Find the path matrix using Warshall's algorithm whose vertex set is {1, 2, 3, 4} and edge set is defined as {(1, 1), (1, 4), (2,1), (4, 2), (3, 2), (3, 4)}. **(5)**

2. Answer these questions for the POSET ({2, 4, 6, 9, 12, 18, 27, 36, 48, 60, 72}, /) **(5)**
   (a) Draw the Hasse diagram of the given POSET,
   (b) Find maximal and minimal elements,
   (c) Find greatest and least elements,
   (d) Find upper and lower bounds of {2, 9}.
   (e) Find l.u.b. and g.l.b of {2, 9}.

3. Consider the group G = {1, 5, 7, 11} under multiplication modulo 12 **(5)**
   (a) Find the order of each element
   (b) Is G cyclic? Justify.
   (c) Find all subgroups.

4. For any real numbers a, b we define $a \oplus b = a + b - 1$ and $a \otimes b = a + b - ab$ then show that $(R, \oplus, \otimes)$ is a ring. Is it a commutative ring with identity? **(5)**

5. For what values of m and n the graphs K_n, $K_{m,n}$, C_n are (i) regular graphs, (ii) Euler circuit and (iii) Hamiltonian circuit ? **(4)**

6. Check the validity of the following argument without using truth table:
   "If it does not rain or if it is not foggy, then the sailing race will be held and the life saving demonstration will go on". "If the sailing race is held, then the trophy will be awarded", and "the trophy was not awarded" imply the conclusion "it rained". **(4)**

7. Construct an automaton in which the word w is accepted by M, if the number n of b's in w is congruent to 2 modulo 3 i.e. (n-2) is divisible by 3. **(3)**

8. Describe the language L = L (G) in set-builder form where G has the productions $S \to aA$, $A \to bbA$, $A \to c$. Also determine highest type of the grammar. **(2)**

9. Construct a FSA that recognize the language generated by the regular grammar having productions $S \to aA$, $S \to bB$, $A \to a$, $B \to a$. **(2)**

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