

B. TECH. SEM - III (INF. TECH.) (2014 COURSE) (CBCS) :
WINTER - 2017

SUBJECT: DISCRETE MATHEMATICS

Day: **Monday**
Date: **15/01/2018**

W-2017-2042

Time: **10.00 AM TO 01.00 PM**
Max Marks: 60

N.B:

- 1) All questions are **COMPLUSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Draw figures **WHEREVER** necessary.
- 4) Assume suitable data if necessary.

Q.1 a) Consider set of integers 1 to 500. Find how many of these numbers are divisible by 3 or by 5 or by 11? **(06)**

- i) Also find how many are divisible by 3 or by 11 but not by all 3, 5 and 11.
- ii) How many are divisible by 3 or 11 but not by 5.

b) Determine validity of following argument: **(04)**
“No human beings are quadrupeds. All men are human beings. Therefore, no man is a quadruped”.

OR

Q.1 How many elements are in the union of five sets if the sets contain 10,000 elements each, each pair of sets has 1000 common elements, each triple of sets has 100 common elements, every four of the sets has 10 common elements, and there is 1 element common in all five sets? **(10)**

Q.2 a) Let R be a relation on a set A, **(05)**
 $A = \{2,3,4,6,8,12,38,48\}$ defined by $R = \{(a, b) | a \text{ is divisor of } b\}$
Draw the diagram and Hasse diagram.

b) Determine whether the relation R is a partial order on the set A. **(05)**
i) $A = Z$, and aRb iff $a = 2b$
ii) $A = Z$ and aRb iff b^2/a

OR

Q.2 a) Given $S = \{1, 2, 3, 4, 5\}$ and relation R on S, where $R = \{(x, y) | x+y = 5\}$. What are the properties of R? **(05)**

b) Explain the process of finding transitive closure by warshall's algorithm. **(05)**

Q.3 Formulate and prove by induction a general formula stemming from following equations: **(10)**

$$\begin{aligned}1^3 &= 1 \\2^3 &= 3+5 \\3^3 &= 7+9+11 \\4^3 &= 13+15+17+19\end{aligned}$$

OR

Q.3 a) Solve $a_r - 5a_{r-1} + 6a_{r-2} = 2^r + r$, $r \geq 2$ with $a_0 = 1, a_1 = 1$ **(06)**

b) Explain generating function with example. **(04)**

P.T.O

Q.4 When a certain defective die is tossed, the numbers from 1 to 6 will appear with the following probabilities: **(10)**

$$P(1) = \frac{2}{18}, P(2) = \frac{3}{18}, P(3) = \frac{4}{18},$$

$$P(4) = \frac{3}{18}, P(5) = \frac{4}{18}, P(6) = \frac{2}{18}$$

Find probability that:

- i) An odd number is on top.
- ii) A prime number is on top.
- iii) A number less than 5 is on top.
- iv) A number greater than 3 is on top.

OR

Q.4 A company purchased 10,000 transistors, 5,000 from supplier A, 3,000 From supplier B and 2,000 from supplier C. It is known that 2% of supplier A are defective 4% of supplier B are defective and 5% of supplier C are defective. **(10)**

- i) If transistor from 10,000 is selected at random, what is the probability that it is defective?
- ii) Given the transistor selected at random is not from supplier A, what is the probability that it is defective?

Q.5 Explain with example: **(10)**

- i) Adjacency matrix
- ii) Handshaking lemma
- iii) Pigeonhole principle
- iv) Eulerian circuit
- v) Hamiltonian path

OR

Q.5 Explain with example: **(10)**

- i) Hamiltonian circuit
- ii) Eulerian path
- iii) Complete bipartite graph
- iv) Planar graph
- v) Euler's formula

Q.6 a) For following sets of weight construct optimal binary prefix code. **(06)**

- i) 10,11,14,16,18,21
- ii) 5, 7, 8,15,35,40

b) Explain following terms with example. **(04)**

- i) Spanning tree
- ii) Optimal tree

OR

Q.6 a) Write steps with example for Huffman algorithm to find an optimal tree. **(06)**

b) Prove that the complement of a spanning tree does not contain a cut set and that the complement of a cut set does not contain a spanning tree. **(04)**

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