18MAB 302T- DISCRETE MATHEMATICS FOR ENGINEERS

Question Bank for CT-II (CSE & ECE)

UNIT – II

PART-A

1). In how many ways can 8 Indians,4 Americans and 4 English mens can be seated in a row so all person of the same nationality sit together?

a) 3! 4!8!4! b) 3! 8! c) 3! 4! D) 3! 3! 8! **Ans: a**

2) A question paper has two A and B each containing 10 questions , if a student has to choose 8 from part A and 5 from part B .In how many ways can he chooses questions?

a) 11340 b) 12750 c) 40 d) 320 **Ans: a**

3) How many numbers must be selected from the set {1, 2, 3, 4} to guarantee that at least one pair of these numbers add up to 7?

a) 14 b) 5 c) 9 d) 24 **Ans: b**

4) In a plane there are 10 points are there out of which 4 points are collinear, then the number of triangles formed is

(a) 110 (b) ${}_{10}C_3$ (c) 120 (d) 116 **Ans d**

5) Among 30 Computer Science students, 15 know JAVA, 12 know C++ and 5 know both. How many students know exactly one of the languages.

(a) 27 (b) 22 (c) 17 (d) 5 **Ans : c**

6) If there are 5 points inside a square of side length 2, prove that two of the points are within a distance of ---------- of each other.

a) $\sqrt{2}$ b) $\sqrt{3}$ c) $\sqrt{5}$ d) $\sqrt{7}$ **Ans : a**

7) If least common multiple of two numbers is 225 and the highest common factor is 5 then find the numbers when one of the numbers is 25?

(a) 75 (b) 65 (c) 15 (d) 45 **Ans : d**

8) The LCM of two prime numbers a and b is

(a) a /b (b) ab (c) a+b (d) 1 **Ans : b**

9) The linear combination of gcd(252, 198) = 18 is?

(a) 252*4 – 198*5 (b) 252*5 – 198*4

(c) 252*5 – 198*2 (d) 252*4 – 198*4 **Ans : a**

10) In a group of 100 people, several will have birth days in the same month. At least how many must have birth days in the same month

(a) 10 (b) 8 (c) 9 (d) 12 **Ans : c**

Part-B

1. Find the number of different 4-letter words with or without meanings, that can be formed from the letters of the word 'NUMBER'
2. Prove that in any group of six people, at least 3 must be mutual friends or at least 3 must be mutual strangers.
3. State fundamental theorem of arithmetic.
4. If a and b are coprime and a and c are coprime then prove that a and bc are coprime.
5. Using Euclid's algorithm, find Greatest common divisor of 540 and 168.

Part-C

6. Find the prime factorization of each of the following integers;

   (i)6647 and (ii) 45,500

7. 5 balls are to be placed in 3 boxes; each can hold all the 5 balls. In how many different ways can place the balls so that no box is left empty, if
   (a) balls and boxes are different?
   (b) balls are identical and boxes are different?
   (c) balls are different and boxes are identical?
   (d) Balls as well as boxes are identical?
8. If we select 10 points in the interior of an equilateral triangle of side 1, show that there must be at least 2 points whose distance apart is less than 1/3.

9. A man hiked for 10 hrs and converted a total distance of 45 km. It is known that he hiked 6 km in the first hour and only 3 km in the last hour. Show that he must have hiked at least 9 km within a certain period of 2 consecutive hours.
10. Find the number of integers between 1 and 250 both inclusive that are not divisible by any of the integers 2, 3, 5 and 7.
11. Use prime factorization, find the gcd and lcm of (i) (231,1575) and (ii) (337500,21600) verify also that gcd(m,n).lcm(m,n)=mn.

UNIT – III

PART-A

1. The contra positive of q→p is a)p→q b)¬ p→¬q c) ¬q→¬p d)p→¬q **Ans (b)**
2. The statement (PVQ) ∧ (P→R) ∧ (Q→R)implies a)R b)P c)Q d)P∧Q **Ans (a)**
3. The dual of ¬P→(P→Q) is a)PV(¬P∧Q) b) ¬ (¬P) ∧ (¬P∧Q) c)P→¬ (P→Q) d)(¬P∧Q) ∧ ¬P **Ans (b)**
4. Which of the following statement is a contradiction? a)(P→¬P)→ ¬P b)(P→(P∨Q) c)(¬Q→P) ∧Q d) PV(P→ Q) **Ans (a)**
5. If p: The sun has set, q: The moon has raised, then symbolically the statement 'The sun has not set or the moon has not risen' is written as (a) p∧~q (b) ~q ∨p (c) ~p ∧q (d) ~p ∨~q **Ans (d)**
6. A compound statement p →q is false only when (a) p is true and q is false. (b) p is false but q is true. (c) atleast one of p or q is false. (d) both p and q are false. **Ans (a)**
7. Every conditional statement is equivalent to (a) its contrapositive (b) its inverse (c) its converse (d)only itself **Ans (a)**
8. For all $n \in N$ -{1}, $7^{2n} - 48n - 1$ is divisible by ….. (a) 25 b) 26 (c) 1234 (d)2304 **Ans (d)**
9. For each $n \in N$, the correct statement is ….. (a) $2^n < n$ (b) $n^2 > 2^n$ (c) $n^4 < 10^n$ (d) $2^{3n} > 7n + 1$ **Ans (c)**
10. If matrix $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then which one of the following holds $\forall\, n \in N$, (use PMI) (a) $A^n = n.A - (n-1)I$ (b) $A^n = 2^{n-1}.A + (n-1)I$ (c) $A^n = n.A + (n-1)I$ (d) $A^n = 2^{n-1}.A - (n-1)I$ **Ans (a)**

Part-B

1. Construct the truth table for $\neg\, q \wedge (p \rightarrow q) \Rightarrow \neg p$.
2. Show that $p \rightarrow s$ follows logically from the premises $\neg p \vee q$, $\neg q \vee r$ and $r \rightarrow s$.
3. Without using truth table for $P \rightarrow (Q \rightarrow P) \equiv \neg P \rightarrow (P \rightarrow Q)$
4. Using truth table prove that (i) $(P \rightarrow (P \vee Q))$ *is* tautology. (ii) $(\neg P \wedge \neg Q) \wedge Q$ is contradiction.
5. Prove by mathematical induction, that for all n ≥ 1 , $n^3 + 2n$ is a multiple of 3.
6. Use mathematical induction to show that $n\,! \geq 2^{n-1}$ *form* ≥ 1.

Part-C

7. Show that $(a \vee b)$ follows logically from the premises

$p \vee q, (p \vee q) \to \neg r, \neg r \to (s \wedge \neg t)$ and $(s \wedge \neg t) \to (a \vee b)$

8. Prove that the following set of premises is inconsistent. If Rama gets his degree, he will go for a job. If he goes for a job, he will get married soon. If he goes for higher study, he will not get married. Rama gets his degree and goes for higher study.
9. Using indirect method of proof, derive $p \to \neg s$ from the premises $p \to (q \vee r)$, $q \to \neg p$, $s \to \neg r$, p.
10. Prove the implication without using truth table $[(p \vee q) \wedge (p \to r) \wedge (q \to r)] \to r$
11. Derive $p \to (q \to s)$ using the CP rule (if necessary) from the premises vvv $p \to (q \to r)$ and $q \to (r \to s)$.
12. Prove that the premises $p \to (q \to r)$, $s \to (q \wedge \neg r)$ and $(p \wedge s)$ are inconsistent.
13. Using mathematical induction method

$$\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \ldots\ldots + \frac{1}{n(n+1)} = \frac{n}{n+1}.$$

14. Use mathematical induction to prove that $8^n - 3^n$ is divisible by 5, for $n \geq 1$
15. Use mathematical induction to prove that $(3^n + 7^n - 2)$ is divisible by 8, for $n \geq 1$.