

DISCRETE MATHEMATICS (BCA 204)

Duration: 2 Hours

Max. Marks: 50

Instructions: Figures to the right indicate maximum marks.

Non Scientific calculator is allowed.

Q I. Solve ANY 2 :

(2 X 5 marks)

1. Using Mathematical Induction, Prove that $\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \dots + \frac{1}{n(n+1)} = \frac{n}{n+1}$.
2. Expand using Binomial theorem:
 - a) $(2x + 1)^5$.
 - b) $(x^2 + \frac{1}{x})^4$.
3. Using Mathematical Induction, Prove that $4 + 8 + \dots + 4n = 2n(n+1)$.

Q II. Solve ANY 2 :

(2 X 5 marks)

1. A touring cricket team of 17 members includes a manager, a captain, a vice-captain, 2 wicket keeper, 6 batsmen, 4 bowlers and 2 all-rounders. A committee of 5 including the manager, the captain and the vice-captain is to be formed. In how many ways a committee is formed if it includes,
 - a) at least one batsmen.
 - b) at least one bowler.
 - c) no wicket keeper.
2. A family of 4 brothers and 3 sisters is to be arranged for a photograph in a row. In how many ways they can be sited.
 - a) If all the sisters sit together
 - b) 2 sisters and 1 brother sit together.
3. Find r ; if $({}^{10}C_r) = ({}^{12}C_{r+2})$.

Q III. Solve ANY 2 :

(2 X 5 marks)

1. Is the following statements Contradiction :
 $[(p \rightarrow q) \leftrightarrow (q \rightarrow \sim p)] \wedge (p \rightarrow \sim q)$
2. A town has a total population of 40,000 out of which 400 people own cars, 10,000 people own bicycles and 300 own both cars and bicycles.
 - a) How many in the town do not own either?

- b) How many in the town own only cars?
- c) How many in the town own only bicycle?

3. Let, $U = \{1,2,3,4,5,6,7,8\}$ $A = \{3,4,5,6\}$ and $B = \{2,3,4,5\}$

- a) Verify $A \cup B = (A - B) \cup B$
- b) Verify $(A \cup B)^c = A^c \cap B^c$

Q IV. Solve ANY 2 :

(2 X 5 marks)

- 1. Prove both Idempotent Law in Boolean Algebra.
- 2. Let $A = \{1, 2, 3\}$ and a relation on A is defined as $R = A \times A$.

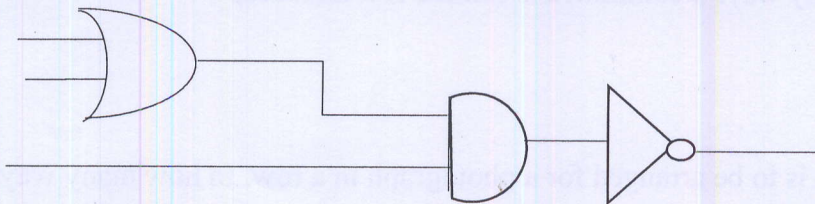
Write the relation R as a set of ordered pair. Is R (a) Reflexive, (b) not symmetric (c) not transitive.

- 3. Is the following statement equivalent?
 $\{(p \wedge q) \wedge \sim(p \vee q)\}$ and $\{(p \wedge q) \leftrightarrow (p \vee q)\}$

Q V. Answer the following:

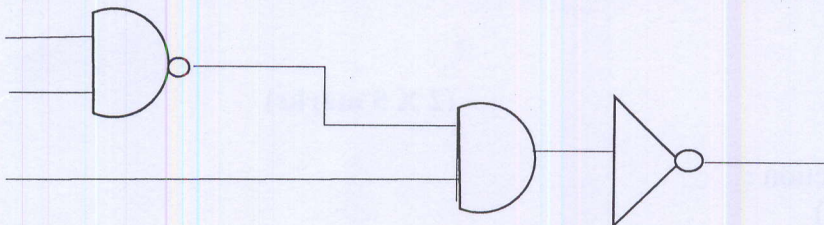
(5 X 2 marks)

- 1. If Inputs are $x_1 = 1, x_2 = 0, x_3 = 0$. Find output for the given circuit.



- 2. Convert $(5237)_8 = (\dots)_{10}$

- 3. If Inputs are $x_1 = 1, x_2 = 1, x_3 = 0$. Find output for the given circuit.



- 4. Convert $(20456)_{10} = (\dots)_{16}$

- 5. State Identity law and Bounded less law in Boolean Algebra

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