

**22MAT121-Discrete Mathematics**  
**AIE-B**

**SET-A**

1. Find the contrapositive, converse and inverse of the following statement: "n is an even number whenever n is a perfect number." [3 marks]
2. show that  $(p \wedge (p \rightarrow q)) \rightarrow q$  is a tautology without using the truth table. [3 marks]
3. Let  $P(x)$ ,  $Q(x)$  and  $R(x)$  are the statements "x is a professor", "x is ignorant" and "x is vain". Represent the following statements using quantifiers, logical connectives,  $P(x)$ ,  $Q(x)$  and  $R(x)$ .
  - (a) No professors are ignorant.
  - (b) All ignorant people are vain.
  - (c) There is a professor who is ignorant and vain. [4 Marks]

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**SET-B**

1. Let  $P(x)$ ,  $Q(x)$  and  $R(x)$  are the statements "x is a clear explanation", "x is satisfactory" and "x is an excuse". Represent the following statements using quantifiers, logical connectives,  $P(x)$ ,  $Q(x)$  and  $R(x)$ .
  - (a) All clear explanations are satisfactory.
  - (b) Some excuses are unsatisfactory.
  - (c) Some excuses are neither satisfactory nor a clear explanation. [4 Marks]
2. Find the contrapositive, converse and inverse of the following statement: "n is an odd number is necessary for n is a prime number." [3 marks]
3. show that  $(\neg q \wedge (p \rightarrow q)) \rightarrow \neg p$  is a tautology without using the truth table. [3 marks]

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**SET-C**

1. show that  $p \leftrightarrow q \equiv (p \wedge q) \vee (\neg p \wedge \neg q)$  without using the truth table. [3 marks]
2. Let  $P(x)$ ,  $Q(x)$  and  $R(x)$  are the statements "x is a baby", "x is illogical" and "x can manage a dog". Represent the following statements using quantifiers, logical connectives,  $P(x)$ ,  $Q(x)$  and  $R(x)$ .
  - (a) Babies are illogical.
  - (b) illogical persons can't manage a dog.
  - (c) Babies are either illogical or can manage a dog. [4 Marks]
3. Find the contrapositive, converse and inverse of the following statement: "n is an solitary number is sufficient for n is a even number." [3 marks]