

**FACULTY OF SCIENCE**

B.Sc. III-Semester (CBCS) Examination, December 2017

Subject: Mathematics

Paper – III

Logic and Sets

Time: 1½ Hour

Max.Marks: 40

**PART – A (2x5 = 10 Marks)**  
[Short Answer Type]

Note: Answer all questions. Each question carries equal marks.

- 1 a) Show that the statement  $-(p \rightarrow q) \rightarrow -q$  is a tautology.  
OR  
b) Show that statements  $p \wedge (-q \vee r)$  and  $p \vee (q \wedge -r)$  are logically not equivalent.
- 2 a) For any finite set A with  $|A| = n \geq 0$  then prove that  $|P(A)| = 2^n$ .  
OR  
b) Express  $\overline{A - B}$  in terms of U and  $-$ .

**PART – B (2x15 = 30 Marks)**

[Essay Answer Type]

Note: Answer all questions. All questions carry equal marks.

- 3 a) Let s and t be statements that contain no logical connective other than  $\wedge$  and  $\vee$ . If  $s \Leftrightarrow t$  then  $s^d \Leftrightarrow t^d$ .  
OR  
b) **Hypothesis:** If I join OU then I will get best education. If I get best education then I will get job in USA. If I get job in USA then I will become a millionaire. I joined OU.  
**Conclusion:** I will become a millionaire. Give an argument using rules of inference to show that the conclusion follows from the hypothesis.
- 4 a) Let S be the sample space for an experiment E. For events  $A, B, C \subseteq S$   
 $Pr(A \cup B \cup C) = Pr(A) + Pr(B) + Pr(C) - Pr(A \cap B) - Pr(A \cap C) - Pr(B \cap C) + Pr(A \cap B \cap C)$ .  
OR  
b) A man alternatively tosses a coin and throws a die beginning with coin. Find the probability that he will get a head before he gets a 5 or 6 on the die.

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