

**DEPT. OF MATHEMATICS**  
**JHARGRAM RAJ COLLEGE**  
**B.Sc(H) Sem – III , INTERNAL ASSESSMENT-1<sup>st</sup> , 2018-19**  
**Sub: MATHEMATICS, Course – SEC 1**

**Full Marks: 5**

**Time: 20 m.**

**Answer any two questions:**

**(2 × 2.5 = 5)**

1. Assuming  $p$  is true ,  $q$  is false and  $r$  is true find the truth value of the proposition  $(p \vee q) \rightarrow \bar{r}$ .
2. Show that the conditional proposition  $p \rightarrow q$  is logically equivalent to its contrapositive proposition  $\bar{q} \rightarrow \bar{p}$ .
3. Show that the compound proposition  $((p \rightarrow q) \wedge (q \rightarrow r)) \rightarrow (p \rightarrow r)$  is a tautology.
4. Show that the compound proposition  $(p \wedge q) \wedge \overline{(p \vee q)}$  is a contradiction.

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**B.Sc(H) Sem – III , INTERNAL ASSESSMENT-2<sup>nd</sup> , 2018-19**  
**Sub: MATHEMATICS, Course – SEC 1**

**Full Marks: 5**

**Time: 20 m.**

**Answer any two questions:**

**(2 × 2.5 = 5)**

1. Find a counter example to the statement " *For every real number  $x$ ,  $x^2 - 1 > 0$ .* "

2. Prove that for some real number  $x$ ,  $\frac{x}{x^2+1} = \frac{2}{5}$  is true.

3. Prove that De Morgan's law for logic  $\overline{p \vee q} \equiv \bar{p} \wedge \bar{q}$ .

4. Prove that  $p \wedge (\bar{q} \vee r)$  and  $p \vee (q \wedge \bar{r})$  are logically equivalent.

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**Answer any two questions:**

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1. Assuming that  $p$  and  $q$  are false and  $r$  and  $s$  are true propositions find the truth value of the proposition  $((p \wedge \bar{q}) \rightarrow (q \rightarrow r) \rightarrow (s \vee \bar{q}))$ .
2. Examine whether the pair of propositions is logically equivalent or not  
 $(p \rightarrow q) \rightarrow r$  and  $p \rightarrow (q \rightarrow r)$ .
3. Determine the truth value of the following statement where domain of discourse is the set of all real numbers. Justify your answer.  
" for every  $x$  , for every  $y$  , if  $x < y$  then  $x^2 < y^2$  ."
4. Show that  $p \rightarrow q$  and  $\bar{q} \rightarrow \bar{p}$  are logically equivalent.

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**Answer any two questions:**

**(2 × 2.5 = 5)**

1. Assuming that  $p$  &  $r$  are false and that  $q$  &  $s$  are true find the truth value of the proposition  
 $(s \rightarrow (p \wedge \bar{r})) \wedge ((p \rightarrow (r \vee q)) \wedge s)$
2. Given that  $p$ : *Today is Monday*,  $q$ : *It is raining*,  $r$ : *It is hot*, then express the proposition  
 $\bar{p} \rightarrow (q \vee r)$  in words.
3.  $p(x, y)$  is a propositional function  $x \geq y$ . Where domain of discourse is the set of all positive integers. Find the truth value of  $\forall x \exists y p(x, y)$ .