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4th SEMESTER **B. Tech. (SE)**

MID SEMESTER EXAMINATION **(March-2019)**

SE208: Discrete Structures

Time: 1:30 Hours **Max. Marks: 25**

Note: All questions are compulsory.

1. **(a)** Prove or disprove that $\left[(p \vee q) \wedge (\neg p \vee r)\right] \rightarrow (q \vee r)$ is a tautology. **[2.5]**

   (b) Use the rules of inference to check that whether $\overline{p}$ is a valid inference from the premises $\left(\overline{p \wedge \overline{q}}\right), \overline{q} \vee r, \overline{r}$. **[2.5]**

2. In how many ways can 20 students out of a class of 32 be chosen to attend class and take notes for the others if
   (a) either Jim or Michelle (or both) go to class? **[2]**
   (b) just one of Jim and Michelle attend? **[1.5]**
   (c) Paul and Michelle refuse to attend class together? **[1.5]**

3. A salesman sells at least one car each day for 100 consecutive days selling a total of 150 cars. Show that for each value of n with $1 \leq n < 50$, there is period of consecutive days during which he sold a total of exactly n cars. **[5]**

4. Use mathematical induction to show that $H_{2^n} \geq 1 + \frac{n}{2}$, whenever n is a non-negative integer. Where $H_n = 1 + \frac{1}{2} + \frac{1}{3} + \ldots + \frac{1}{n}$. **[5]**

5. A bank pays 6% annual interest on savings, compounding the interest monthly. If X deposits Rs. 1000 on the first day of May, use recurrence relation to find the worth of this deposit after one year. **[5]**

~All the best~