VIT

Vellore Institute of Technology

Winter Semester 2019-2020
Continuous Assessment Test – I
Programme Name: B. Tech.

Course Name: Discrete Mathematics and Graph Theory
Slot : A1+TA1+TAA1

Course Code : MAT1014
Exam Duration: 90 minutes

Answer All the Questions (5 × 10 = 50)

1. (a) Write down the contrapositive, the converse and the inverse of the statement, "If it is raining, then the home team wins." (2)

(b) Obtain PDNF and PCNF of the statement formula $(P \rightarrow (Q \wedge R)) \wedge ((\neg P \rightarrow (\neg Q \wedge \neg R))$. (8)

2. Construct an argument to show that the following premises imply the conclusion "it rained."

(i) If it does not rain or if there is no traffic dislocation, then the sports day will be held and the cultural programme will go on.

(ii) If the sports day is held then then trophy will be awarded.

(iii) The trophy was not awarded. (10)

3. (a) Let $P(m, n)$ be "n is greater than or equal to m" where the domain (universe of discourse) is the set of nonnegative integers. What are the truth values of

(i) $(\exists n)(\forall m)P(m, n)$ (ii) $(\exists m)(\forall n)P(m, n)$. (2)

(b) Show that the premises "A student in this class has not read the book" and "Everyone in this class passed the first exam" imply the conclusion "Someone who passed the first exam has not read the book." (8)

4. Show that $(\exists x)(F(x) \wedge S(x)) \rightarrow (y)(M(y) \rightarrow W(y))$ and $(\exists y)(M(y) \rightarrow W(y))$ imply $(x)(F(x) \rightarrow \neg S(x))$. (10)

5. (a) Define Semigroup and Monoid. What is the relationship between them? Justify your answer. (2)

(b) Prove that the set of four functions f_1, f_2, f_3 and f_4 on the set of non-zero complex numbers $\mathbb{C} - \{0\}$ defined by $f_1(z) = z, f_2(z) = -z, f_3(z) = \frac{1}{z}$ and $f_4(z) = -\frac{1}{z}$, $\forall z \in \mathbb{C} - \{0\}$ forms an abelian group with respect to the composition of functions. (8)

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