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48 (DS)

[16–HRAGDA–M3]

MCA/MScIT 3rd Semester Exam., 2016

DISCRETE MATHEMATICS

[MCA (S3) 09]

Full Marks : 80

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Answer any *five* from the following questions : 2×5=10

(a) What is an algebraic system? Give examples.

(b) What is a partial ordering relation? Give an example.

(c) When is a statement formula said to be in the normal form?

(d) What do you mean by quantifiers? Write two types of quantifier.

(e) How many diagonals are there in a polygon of 10 sides?

(f) Define complete graph. Give examples.

2. Answer any *three* from the following questions : 4×3=12

(a) Explain different types of relation.

(b) Determine whether

$$(p \to q) \wedge (q \to r) \to (p \to r)$$

is a tautology or contradiction or neither.

(c) If G is a set of non-zero real numbers and $a * b = \frac{ab}{2}$, then show that $(G, *)$ is an Abelian group.

(d) Prove that 'In a graph, G, the number of odd vertices is an even number.

3. Answer any *three* from the following questions : 6×3=18

(a) Explain the fundamental connectors using the truth tables.

(b) Define composition of functions. Let $f : R \to R$ be defined by $f(x) = 2x + 5$. Find a formula for the inverse function

$$f^{-1} : R \to R \qquad 1+5=6$$

(c) How many words can be formed with the letters of the word 'TENNESSEE'?

(d) Verify the validity of the following argument :

All men are mortal.
Socrates is a man.

Therefore, Socrates is mortal.

4. Answer any *four* from the following questions : 10×4=40

(a) Define equivalence relation on a set. Let $S = \{a, b, c\}$ and $P(S)$ is a power set of S. Is the relation of set inclusion $\subseteq$ *(i)* a partial order and *(ii)* an equivalence relation on $P(S)$? 2+4+4=10

(b) Define the terms semigroup, monoid and Abelian group. Prove that if every element of a group $(G, *)$ is its own inverse, then G is Abelian. 5+5=10

(c) What is a planar graph? Prove that K_5 is non-planar. 10

(d) Define the rule of inference. Explain the different rules of inference. 2+8=10

(e) What do you mean by ${}^nP_r$ and ${}^nC_r$? How many combinations and permutations can be made with the letters of the word 'PARABOLA' taken three at a time? 2+8=10

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