

2018

CBCS

3rd Semester

MATHEMATICS

PAPER—SEC1T

(Honours)

Full Marks : 40

Time : 2 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Logic and Sets

UNIT—I

1. Answer any one question :

1×2

(a) Construct the truth table for $(p \rightarrow q) \rightarrow (q \rightarrow p)$.

(b) Let $P(x)$ denotes the statement " $x = x^2$ ". If the domain consists of the integers what is the truth values of

(i) $\exists x P(x)$ and (ii) $\forall x P(x)$

2. Answer any *three* questions :

3×5

(a) (i) Define conditional propositions with truth table.

2

(ii) What are the contra positive, converse and Inverse of the conditional proposition

"If it is raining then the home team wins". 3

(b) Show that $p \vee (q \wedge r)$ and $(p \vee q) \wedge (p \vee r)$ are logically equivalent.

5

(c) Translate each of these statements into logical expressions using predicates quantifies and logical connectivities

(i) No Physics students know C++

(ii) All Mathematics students know C++

- (iii) Not every Physics student knows C^{++}
- (iv) At least one Mathematics student knows C^{++}
- (v) No Physics students nor Mathematics students know C^{++} . 5
- (d) Determine the truth value of these statements if the domain for all variables consists of all integers
- (i) $\forall n \exists m (n^2 < m)$
- (ii) $\exists n \forall m (n < m^2)$
- (iii) $\forall n \exists m (n + m = 0)$
- (iv) $\exists n \exists m (n^2 + m^2 = 5)$
- (v) $\exists n \exists m (n + m = 4 \wedge n - m = 1)$ 5
- (e) What is tautology? Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology. 1 + 4

Unit-II

3. Answer any one question : 1 × 2

- (a) If $n(A) = 5$ and $n(B) = 3$. Then find the maximum and minimum value of $n(A \cup B)$.

- (b) Find the numbers between 1 and 500 that are divisible by 2, 3 and 5.

4. Answer any one question : 1×5

(a) (i) If $a\mathbb{N} = \{ax : x \in \mathbb{N}\}$, then find $3\mathbb{N} \cap 7\mathbb{N}$ where \mathbb{N} is the set of natural numbers. 3

(ii) Show that f is the subset of every set. 2

(b) (i) Define power set. If a finite set has n elements then show that the power set has 2^n elements. 1+2

(ii) Differentiate between proper subset and subset with suitable examples. 2

Unit—III

5. Answer any one question : 1×10

(a) (i) For any three sets A , B and C , prove that

$$A \times (B \cup C) = (A \times B) \cup (A \times C). \quad 5$$

(ii) Define symmetric difference between two sets. 1

(iii) If A and B be two subsets of a set X , then prove that $A \subset B \Leftrightarrow X - B \subset X - A$. 4

(b) (i) A relation ρ is defined on the set \mathbb{Z} by " $a\rho b$ iff $2a + 3b$ is divisible by 5 $\forall a, b \in \mathbb{Z}$ ". Show that ρ is an equivalence relation. 5

(ii) Define partial order relation. Show that the relation ' \subseteq ' (subset) defined on the power set $P(S)$ is a partial order relation. 1+4

6. Answer any *three* questions : 3×2

(a) Let ρ and ρ' be two equivalence relations then show that $\rho \cap \rho'$ is also equivalence relation.

(b) Define partition of a set.

(c) Let A be a set with 2 elements How many reflexive relations can be defined on A ?

(d) Give an example of a relation which is symmetric but not reflexive and transitive.

Object Oriented Programming in C++

1. Answer any *five* questions :

5×2

- (a) What are the different features of C++?
- (b) Differentiate between pointer and reference variable.
- (c) What are the different types of inheritance in C++?
- (d) Explain Inline function.
- (e) What do you mean by enumeration?
- (f) What is implicit and explicit type conversion in C++?
- (g) Differentiate between global and local object.
- (h) What is friend function?

2. Answer any *four* questions :

4×5

- (a) Discuss how data and functions are organized in an object oriented paradigm. List the major areas of application of OOP.

- (b) What do you mean by member access modifiers in C++? Explain exception handling with example.
- (c) Define copy constructor. Explain various types of constructors with examples.
- (d) Explain Multi-level and Multiple inheritances with examples.
- (e) Write different uses of scope resolution operator (::) in C++.
- (f) Write a program to calculate area of rectangle using inline functions.

3. Answer any *one* question : 1×10

- (a) Discuss the features of a function template. Write a C++ program to create a function template for finding minimum number out of given numbers.

- (b) What is polymorphism? Elaborate the statement "Overloading is a type of polymorphism" with the help of suitable example and using the concept of function overloading.
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