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UG/3rd Sem/MATH(H)/T/19

2019

B.Sc.

3rd Semester Examination

**MATHEMATICS (Honours)**

**Paper - SEC1T**

Full Marks : 40

Time : 2 Hours

*The figures in the 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**

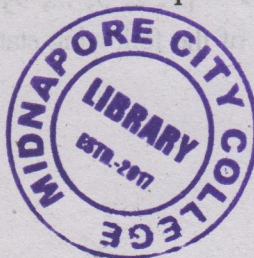
1. Answer any *one* question : 1×2

(a) Write the negation of each of the following statements :

- (i) He swims if and only if the water is warm.
- (ii) This computer program is correct if and only if, it produces the correct answer for all possible sets of input data.

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( 2 )

(b) What do you mean by argument and valid argument in propositional logic ?

2. Answer any *three* questions : 3×5

(a) What do you mean by principal disjunctive normal form ? Obtain the principal disjunctive normal form of the followings :

(i)  $p \Rightarrow q$ , (ii)  $q \vee (p \vee \sim q)$  1+2+2

(b) (i) Prove the validity of the following argument

'If I get the job and work hard, then I will get promoted. If I get promoted, then I will be happy, otherwise I will not be happy. Therefore, either I will not get the job or I will not work hard'.

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(ii) Prove that if  $\sqrt{2}$  is irrational by giving a proof of contradiction. 2

(c) Prove that the following proposition is Tautology (without truth table)

$[(p \vee q) \wedge (p \rightarrow r) \wedge (q \rightarrow r)] \rightarrow r$  5

(d) Let  $D = \{1, 2, 3, \dots, 9\}$ . Determine the truth value of the following statements.

( 3 )

(i)  $(\forall x \in D)x+4 < 15$

(ii)  $(\forall x \in D)x+4 > 15$

(iii)  $(\forall x \in D)x+4 \leq 10$

(iv)  $(\exists x \in D)x+4 > 15$

(v)  $(\exists x \in D)x+4 = 10$  1+1+1+1+1

(e) (i) Show that  $\exists x Q(x)$  is a valid conclusion from the premises :  $\forall(x)(P(x) \rightarrow Q(x))$  and  $\exists x P(x)$ .

(ii) Write down the negation of the following proposition "for every number x there is a number y such that  $y < x$ ". 3+2

### Unit - II

3. Answer any *one* question : 1×2

(a) (i) Find the following set in set-builder form  
 $A = \{3, 6, 9, 12, 15\}$ . 1

[ Turn Over ]



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(ii) Represent the following set in tabular form

$$A = \{x : x^2 - 3x + 2 = 0\} \quad 1$$

(b) Let  $A_n = \{x : x \text{ is a multiple of } n, n \in N\}$ . Find

(i)  $A_2 \cup A_7$  (ii)  $A_4 \cap A_6$ .

4. Answer any *one* question : 1×5

(a) Show that the set of real numbers in  $[0, 1]$  is uncountable set. 5

(b) For the sets  $A = \{1, 3, 5, 7, 9\}$ ,  $B = \{2, 4, 6, 8\}$  and  $C = \{3, 6, 9\}$ , verify the distributive laws. 5

### Unit - III

5. Answer any *one* question : 1×10

(a) (i) Find how many integers between 1 and 60 that are not divisible by 2 nor by 3 and nor by 5. Also determine the number of integers divisible by 5, not by 2, not by 3. By set theoretic approach. 5

(ii) What are the concept of partial ordered relation ? Explain with two examples. 5

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(b) (i) Let  $A_0, A_1$  and  $A_2$  be three subsets of  $Z$  defined by  $A_i = \{3n+i : n \in Z\}$  for  $i = 0, 1, 2$ . Show that  $A_0, A_1$  and  $A_2$  form a partition of the set  $Z$ .

(ii) Determine the nature of the following relations  $R$  on the set  $Z$ .

(A)  $a R b$  if and only if  $a, b \in Z$  and  $ab \geq 0$

(B)  $a R b$  if and only if  $a, b \in Z$  and  $|a-b| \leq 3$ . 4+3+3

6. Answer any *three* questions : 3×2

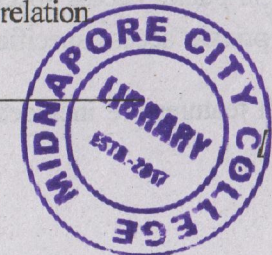
(a) Prove that  $A - B = A \cap B'$

(b) Let  $S$  be a set containing three elements. How many different binary relations can be defined on  $S$  ?

(c) Give an example of anti-symmetric relation.

(d) Define 'domain' and 'range' of a relation.

(e) Define n-ary relation



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## Object Oriented Program in C++

### Group - A

Answer any *five* questions out of eight questions carrying 2 marks of each.  $5 \times 2 = 10$

1. What is constructor ? Explain.
2. What do you mean by object and class ?
3. Write a brief note on 'C out'.
4. What is the function of dynamic memory allocation?
5. What do you mean by preprocessor directive ?
6. Explain the array in C++.
7. Differentiate between looping and branching ?
8. What is conditional operator in C++ language ?

### Group - B

Answer any *four* questions out of six questions carrying 5 marks of each.  $5 \times 4 = 20$

9. What is public access specifier ? How is it different from private access specifier ?
10. Which features are included in C++ from C ?

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11. What are the differences between object oriented programming and procedural oriented programming ?
12. Write a brief note on function polymorphism.
13. Explain dynamic binding with an example.
14. Distinguish between private and public inheritance.

### Group - C

Answer any *one* question out of two questions carrying 10 marks of each.  $1 \times 10 = 10$

15. Write a C++ program to overload addition (+) and multiplication (\*) operators to perform addition and multiplication of two complex numbers. 10
16. (a) What is encapsulation ? Why is it important in C++ ?  
(b) Write a C++ program to find the factorial of a given integer. 5+5

