Code : 303102

BCA 1st Semester Exam., 2021

BASIC MATHEMATICS

Time : 3 hours *Full Marks* : 60

Instructions :

(i) The marks are indicated in the right-hand margin.

*(ii) There are **SEVEN** questions in this paper.*

*(iii) Attempt **FIVE** questions in all.*

*(iv) Question Nos. **1** and **2** are compulsory.*

1. Choose the correct answer (any *six*) : 2×6=12

(a) If x and y are real numbers, then the value of

$$\max(x, y) + \min(x, y)$$

is

(i) x

(ii) y

(iii) x / y

(iv) None of the above

(b) Let $A = [-2]$. Then $\det(A)$, i.e., $|A|$ is

(i) 2

(ii) 1

(iii) 0

(iv) None of the above

(c) For a set A, the power set of A is denoted by 2^A. If $A = \{5, \{6\}, \{7\}\}$, which of the following are true?

1. $\varnothing \in 2^A$
2. $\varnothing \subseteq 2^A$
3. $\{5, \{6\}\} \in 2^A$
4. $\{5, \{6\}\} \subseteq 2^A$

(i) 1 and 3 only

(ii) 2 and 3 only

(iii) 1, 2 and 3 only

(iv) 1, 2 and 4 only

(d) The number of positive integers lying between 1 and 100 (both inclusive) and not divisible by 2, 3 and 5 is

(i) 30

(ii) 90

(iii) 95

(iv) None of the above

(e) If $Mdx + Ndy = 0$ has the form $f(y)dx + g(x)dy = 0$, the integrating factor is

(i) $1/(Mx - Ny)$

(ii) $1/(Mx + Ny)$

(iii) $1/((Mx - Ny) \neq 0)$

(iv) None of the above

(f) In a set of people, the relation 'x is not older than y' satisfies which property?

(i) Transitivity

(ii) Reflexivity

(iii) Antisymmetric

(iv) Symmetric

(g) The pair of equations $x + 2y + 5 = 0$ and $-3x - 6y + 1 = 0$ has

(i) a unique solution

(ii) exactly two solutions

(iii) infinitely many solutions

(iv) no solution

(h) The propositional statement $(P \rightarrow (Q \vee R)) \rightarrow ((P \wedge Q) \rightarrow R)$ is

(i) satisfiable but not valid

(ii) valid

(iii) a contradiction

(iv) None of the above

(i) In an examination, a student scores 4 marks for every correct answer and loses 1 mark for every wrong answer. If he attempts all 75 questions and secures 125 marks, the number of questions he attempted correctly is

(i) 35

(ii) 40

(iii) 42

(iv) 46

(j) If $f(x) + f(1 - x) = 1$, then

$f(1/1997) + f(2/1997) + \ldots + f(1996/1997)$

is

(i) 999

(ii) 998

(iii) 919

(iv) 918

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

(a) One kind of bacteria y grows according to the equation $\frac{dy}{dt} = ky$, where k is a constant and t is measured in years. If the amount of the bacteria doubles every 5 days, then find the value of k.

(b) Let A and B be sets and let A^c and B^c denote the complements of the sets A and B. Simplify the expression

$$(A - B) \cup (B - A) \cup (A \cap B)$$

(c) Let $A = \{1, 2, 3, 4\}$. Make the relation (R) over $A \times A$ as $R = \{(a, b) \mid a + b > 2$ and $a, b \in A\}$. Is it transitive?

(d) Check whether $a \vee b \to b \wedge c$ is tautology or not.

(e) Find the value of $\int_0^3 e^x \, dx$.

3. Find the value of the integral

$$\int_0^6 \frac{1}{1+x^2} dx$$ 12

4. Find the number of subsets of $\{1, 2, ..., n\}$ with odd cardinality. 12

5. If $x = t^2 - 1$ and $y = 2e^t$, then find $\frac{dy}{dx}$. 12

6. Find the area enclosed by the curve $y = f(x)$ defined parametrically as

$$x = \frac{1-t^2}{1+t^2}, \quad y = \frac{2t}{1+t^2}$$ 12

7. Find the fourth derivative of $x^3 \log x$ with respect to x, using Leibnitz theorem. 12

★ ★ ★