Code : 303102

BCA 1st Semester Theory Examination, 2017

Basic Mathematics

Time : 3 Hrs *Full Marks : 60*

Instructions :

(i) *The questions are of equal value.*

(ii) *There are **Seven Questions** in this paper.*

(iii) *Attempt Five questions in all.*

(iv) ***Question Nos. 1 & 2 is compulsory.***

1. Answer any six of the following:

(a) A function f(x) is continuous the interval [0, 2]. It is known that f(0) = f(2) = –1 and f(1) = 1. which one of the following statements must be true?

(i) There exists a y in interval (0,1) such that f(y) = f(y+1)

(ii) For every y in the interval (0,1), f(y) = f(2 – y).

(iii) The maximum value of the function in the interval (0.2) is 1

(iv) There exists a y in the interval (0,1) such that f(y) = f(2 – y)

(b) Find the number of positive integers lying between 1 and 100 (both inclusive) but NOT divisible by 2, 3 and 5.

(c) The power set of countabily infinite set is:

(i) Countable

(ii) Uncountable

(iii) None of these

(d) For a set A, the power set is denoted by 2^A. If A={5, {6}, {7}}, find all the sub-sets of 2^A.

(e) Let A = {1, 2, 3} and B= {2, 3, 1}. Find A-B.

(f) Let P (A) denote the power set of A. If P (A) $\subseteq$ B then

(i) $2^{|A|} \leq |B|$

(ii) $2^{|A|} \geq |B|$

(iii) $2^{|A|} < |B|$

(iv) None of these

(g) Find the slope of $x^2y = 8$ at the point (2, 2).

(h) Find the second derivative of $x^3 - 5x^2 + x = 0$.

(i) If $f(x) = x^3 + 3x^2 + 4x + 5$ and g(x)=5, then find g((f(x)).

(j) Find the value of $\int_0^x x^2 dx$

2. (a) Prove that, for all sets A, B and C $(A - B) \cap (C - B) = (A \cap C) - B$.

(b) Let : $X \to Y$ and g : $Y \to Z$. Let $h = g^{\circ} f : X \to Z$ Suppose g is one-to-one and onto. Now, if f is one-to-one, then prove that h is one-to-one.

(c) If $y = (t^2 + 2)^2$ and $t = x^{1/2}$, determine dy/dx.

(d) At t = 0, a particle starts at rest and moves along a line in such a way that at time t its acceleration is $24t^2$ feet per second per second. Through how many feet does the particle move during the first 2 seconds?

(e) If $F(x) = \int_0^x e^{-t^2}\,dt$, then find F'(x).

3. The number of bacteria in a culture is growing at a rate of $3000e^{\frac{2}{5}}$ per unit of time t. At t=0, the number of bacteria was present 7,500. Find the number present at t=5.
4. If dy/dx = 4y and if y=4 when x=0, then y=?
5. If $y = e^{nx}$, then find $d^n y / dx^n$.
6. What is the area of the region completely bounded by the curve $y = -x^2 + x + 6$ and the line y = 4?
7. The line segment connecting (x, 6) and (9, y) is bisected by the point (7, 3). Find the values of x and y.

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