



DE-2935

First Year B. Sc. (Sem. I) Examination

March / April – 2016

Mathematics for Computer Science

(MCS-102 : Calculus - I)

Time : 3 Hours]

[Total Marks : 70

Instructions :

(1)

नीचे दृशविवेक निशानीवाणी विगतो उत्तरवही पर अवश्य कर्तवी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
<input type="checkbox"/> F. Y. B. Sc. (Sem. 1)	<input type="text"/>
Name of the Subject :	<input type="text"/>
<input type="checkbox"/> Mathematics for Computer Science	<input type="text"/>
Subject Code No. : <input type="text" value="2"/> <input type="text" value="9"/> <input type="text" value="3"/> <input type="text" value="5"/>	<input type="text"/>
Section No. (1, 2,.....) : <input type="text" value="Nil"/>	<input type="text"/>
	Student's Signature

(2) All questions are compulsory.

(3) Figures to the right indicate full marks of the question.

1 Answer the following questions : 10

(1) Define constant function with illustration.

(2) When do you say that the function is continuous at a given point ?

(3) Evaluate  $\int_6^{10} \frac{dx}{x+2}$

(4) If  $y = \sin x + \cos x$  then find  $y_{4n}$ .

(5) Find  $\lim_{x \rightarrow 3} \frac{x^2 - 9}{x - 3}$

2 (A) If  $f(x) = x^2 + 4x + 5$  and  $g(x) = 2x + 1$  then prove that 5

$$f(1) - 2g(2) = 0.$$

OR

(A) If  $f: R^+ \rightarrow R^+$ ,  $f(x) = x^2$ ,  $g: R^+ \rightarrow R^+$ ,  $g(x) = \sqrt{x}$  then 5

find  $f \circ g$ ,  $g \circ f$ ,  $f \circ f$ ,  $g \circ g$

(B) Attempt any two : 10

(1) Examine whether the function  $f(x) = 3x + 2x - 1$  is continuous at  $x = 2$  or not.

(2) If  $F: N \rightarrow N$  and  $f(x) = \frac{x^2(x+1)}{4}$  then prove that

$$f(x) - f(x-1) = x^3$$

(3) If  $f(x) = \frac{1}{x}$ ,  $x \in Z - \{-1, 0, 1\}$  then prove that

$$f(x+1) - f(x-1) = \frac{2}{1-x^2}$$

(4) If  $f(x) = x(x-1)(2x-1)$  then prove that

$$f(x+1) - f(x+2) = -6(x+1)^2$$

3 (A) Obtain  $\lim_{x \rightarrow \infty} (\sqrt{x^2 + x + 1} - \sqrt{x^2 + 1})$  5

OR

(A) Obtain  $\lim_{x \rightarrow -1} \frac{x^3 + 1}{x^2 - 1}$  5

(B) Attempt any two : 10

(1) Show that the  $\lim_{x \rightarrow 0} \cos\left(\frac{1}{x}\right)$  does not exist.

(2) Obtain  $\lim_{x \rightarrow \infty} 7x^3 + 8x^2 + 5x - 7$

(3) Show that  $\lim_{x \rightarrow 0} \left(\frac{1}{x}\right)$  does not exist.

(4) Obtain  $\lim_{x \rightarrow 2} \left(\frac{x^2 - 4}{x^3 - 4x^2 + 4x}\right)$

4 (A) If  $y = \cos(ax + b)$ ;  $a, b \in R$  then find  $y_n$ . 5

OR

(A) Find  $\frac{dy}{dx}$  of  $y = \frac{x^{\frac{1}{2}}(1-2x)^{\frac{2}{3}}}{(2-3x)^{\frac{3}{4}}(3-4x)^{\frac{4}{5}}}$  5

(B) Attempt any two : 10

(1) Obtain  $n^{\text{th}}$  derivative of  $y = \frac{x^2}{(x+2)(2x+3)}$

(2) Obtain the derivative of  $y = \log(ax+b)$ ;  $a, b, x \in R$

(3) If  $y = (\cos x)^{\log x}$  then find  $\frac{dy}{dx}$

(4) If  $y = x \log\left(\frac{x-1}{x+1}\right)$  then find  $y_n$

5 (A) Find the area of the region bounded by the parabola  $y^2 = 4x$  and the line  $y = 4x$ . 5

**OR**

(A) Obtain  $\int x^2 \cos x dx$  5

(B) Attempt Any TWO : 10

(1) Evaluate  $\int_0^{\frac{\pi}{2}} \sin^3 x dx$

(2) Evaluate  $\int_0^{\infty} \frac{\log x}{x^2} dx$

(3) Evaluate  $\int \frac{2x dx}{\sqrt{1-x^4}}$

(4) Evaluate  $\int \frac{e^{\tan^{-1} x}}{1+x^2} dx$