RAKA

First Year B.Sc (Hons.) Incourse (Second) Examination 2011

Course No. MATH 1124 : Calculus

Department of Computer Science and Engineering

Full Marks : 25 Time : 1 (One) hour

$1+2x^2+x^4$

$-(1+2x^2)$

N.B. : Answer the following questions.

1. What is the difference between $\lim_{x\to x_0} f(x)$ and $f(x_0)$. 2

2. Evaluate : (a) $\lim_{x\to 2}\frac{|x-2|}{x-2}$; (b) $\lim_{x\to 3} f(x)$, where $f(x)=\begin{cases} x^2-5 & if \quad x\le 3 \\ \sqrt{x+13} & if \quad x>3 \end{cases}$.

   (c) $\lim_{x\to 0}\frac{\tan x-\sin x}{x^3}$. 9

3. Define the continuity of a function f at a point $x=x_0$. Make f as a piecewise function, and then discuss the continuity of f at $x=1$, where f is defined by $f(x)=|x-1|$. 8

4. Compute $\frac{dy}{dx}$: (a) $y=\sin^{-1}\left(\frac{1-x^2}{1+x^2}\right)$; (b) $y=x^{\sin x}$. 6

$\frac{\sin x}{\cos x} - \sin -$

$\sin - \left(\frac{1}{\cos x} - 1\right)$

$\sin - \left(\frac{\cos x - 1}{\cos x}\right)$

$\frac{\sin x}{2}$

x_0

0

$-x$

RAKA

First Year B.Sc (Hons.) Incourse (First) Examination 2011

Course No. MATH 1124 : Calculus

Department of Computer Science and Engineering

Full Marks : 25 Time : 1 (One) hour

N.B. : Answer the following questions.

1. (a) What is a function f from a non-empty set X to another non-empty set Y. Give two examples of functions.

   (b) Is $y^2=x^4$ a function of x? Justify your answer.

2. Define the domain and range of a function. Compute the domain and range of the following functions defined by

   (i) $f(x)=16-x^2$; (ii) $g(x)=\sin x+|\sin x|$; (iii) $h(x)=2\cosh x+1$.

   Hence, sketch them.

3. Compute the composition function $(f\circ g)(x)$ where $f(x)=\sqrt{x-2}$ and $g(x)=x+1$.

4. Define the inverse function of a function. Find the inverse of $f(x)=\tan x$, $-\pi/2<x<\pi/2$.

   scalar

5. Define exponential function.

$(16+x^2)$

$y^2=x^4 \to 0$

$y=\pm x^2$

Scanned by CamScanner

2nd In-course exam; Session 2010-2011
Course: Physics; Course Code: 1122
Dept. of Computer Science and Engineering,
University of Dhaka
Time: 45 Minutes, Total Marks: 12

Answer All the Questions

Q. 1 State and explain the Carnot's theorem. 4

Q. 2 Prove that a simple shear θ is equivalent to two equal strains of $\frac{\theta}{2}$, an extension and a compression, at right angle to each other. 4

Q. 3 Mention how Miller Index is set for any plane of a Crystal structure. Explain it with proper diagram and example. 4

Department of Computer Science and Engineering, University of Dhaka
Mid-term examination, Session: 2010-2011
Time: 45 Minutes, Marks: 15

Answer all the questions:

Prove that the total energy of an object moving in simple harmonic motion is proportional to the square of the maximum displacement of that object. 6

Two same types of wave having maximum amplitude of 2 cm, frequency of 1KHz, moving opposite to one another with a velocity of $3X10^8$ m/s. Find the expression for the complex wave, distance between two adjacent anti-node positions of the complex wave. 5

Draw time diagrams of the following equation $y = y_m e^{nt} \sin(\delta - \omega t)$ 4

a) n= any negative number, time period T= 2 ms and δ = 45 degree
b) n= any positive number, Time period T = 4ms and δ= 90 degree

Scanned by CamScanner

University of Dhaka
Department of Computer Science
First Year 1st Semester 2013-14 First Incourse Examination
Course No. MATH-1124 Calculus Marks: 30

Answer any 5 questions. All questions are of equal value. Time: 1 (One) hour.

1. (a) Define function. What do you mean by domain and range of a function? Sketch and find the domain and range of the following functions:

(i) $f(x) = \frac{x}{|x|}$ (ii) $f(x) = \sqrt{x-3}$

(b) If $f(x) = \begin{cases} 1+x, & x > 0 \\ 1-x, & x \le 0 \end{cases}$ does $f'(0)$ exist?

2. (a) Find the differential coefficients of the following functions:

(i) $y = x^{\tan^{-1} x} + (\sin x)^{\log x}$ (ii) $y = \frac{3at^2}{1+t^3},\ x = \frac{3at}{1+t^3}$ (iii) $y = \sin(e^x)\log x$

(b) If $y = e^{a\sin^{-1} x}$, then show that,

$$(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2+a^2)y_n = 0.$$

3. (a) Evaluate the following limits:

(i) $\lim_{x\to 2} \frac{x^3+3x^2-12x+4}{x^3-4x}$ (ii) $\underset{x\to 0}{Lt} \frac{\cos 2x - 1}{\cos x - 1}$

(b) State L' Hospitals rules. Apply this rule to evaluate

(i) $\lim_{x\to 0}\left(\frac{1}{x} - \frac{1}{e^x - 1}\right)$ (ii) $\lim_{x\to 0} \frac{e^x - e^{-x} - 2x}{x^2 \sin x}$

4. Test the continuity and differentiability of a function $f(x)$ at a point $x = 1$, where $f(x) = |x| + |x-1|$.

5. (a) Differentiate $\tan^{-1}\frac{x}{\sqrt{1-x^2}}$ with respect to $\sec^{-1}\frac{1}{2x^2-1}$.

(b) A 5 ft ladder, leaning against a wall, slips in such a way that its base is moving away from the wall at a rate of 2 ft/sec at the instant when the base is 4 ft away from the wall. How fast is the top of the ladder moving down the wall at the instant?

Scanned by CamScanner

Department of Computer Science and Engineering
University of Dhaka
Course: CHE 1123; Exam: Midterm 1, Session: 2014
Full Marks: 15 **Time 1h**

Answer All Question

1. (a) Derive de Broglie's wave equation. 1
   (b) Explain the multiplicity of the spectral line of a hydrogen atom. 2
   (c) State Pauli's exclusion principle. 1
   (d) Find the maximum number of electrons in third energy level with the help of Pauli's exclusion principle. 1
   (e) An electron is in 4f orbital. What possible values for the quantum numbers n, l, m and s it can have? 1

2. (a) Give reasons of chemical bonding. 1
   (b) Sodium iodide is soluble in water while silver iodide is not, explain. 1
   (c) Why does ice float in water? 1
   (d) What is salvation of ion? Show it with suitable example. 1.5
   (e) Classify H-bonding and show the type of H-bonding in *O*-hydroxybenzoic acid. 2
   (f) Metals are good conductors of electricity explain. 1

Biplob

Department of Computer Science and Engineering
University of Dhaka
Time: 50 Minutes Physics-1122: Physics Incourse Exam-I Total Marks-25

1. Define flux density φ_B? Explain the physical interpretation of $\vec{\nabla}_0\vec{B} = 0$. 1+4
2. Find out the electric field intensity E outside a uniformly charged sphere of radius R and total charge q. 5
3. Show that the Faraday's law can be expressed in differential form as $\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$. 5
4. Derive the continuity equation from the concept of charge conservation. 5
5. Explain the discrepancy of Ampere's law. 5

Scanned by CamScanner

University of Dhaka

Department of Computer Science and Engineering

First Year 1st Semester 2014-15 2nd In-course Examination

Course No. MATH-1124 Calculus Marks: 30

Answer any 5 questions. All questions are of equal value. Time: 1 (One) hour.

1. Evaluate the following integrals (any four):

(i) $\int \frac{dx}{\sqrt{1-x-x^2}}$ (ii) $\int \sqrt{25-9x^2}\,dx$ (iii) $\int \frac{1+\cos x}{x+\sin x}dx$ (iv) $\int \frac{dx}{(1+x^2)\sqrt{\tan^{-1}x+3}}$

(v) $\int \frac{x^2}{x^2-4}dx$

2. (a) Evaluate the following indefinite integrals (any four):

(i) $\int_0^{\log 2} \frac{e^x}{1+e^x}dx$ (ii) $\int \cos 2x \cos 3x\,dx$ (iii) $\int_0^1 \tan^{-1}x\,dx$

(iv) $\int_0^{\pi/2} \frac{dx}{a^2\cos^2 x+b^2\sin^2 x}$ (v) $\int \frac{e^x}{e^{2x}+2e^x+5}dx$

3. Find the reduction formula for $I_n=\int \sin^n x\,dx$. Hence, evaluate $\int \sin^6 x\,dx$.

4. (a) Define homogeneous function and state Euler's Theorem on homogeneous function.

(b) If $I_n=\int_0^{\pi/4}\tan^n\theta\,d\theta$, then show that $\boxed{n(I_{n+1}+I_{n-1})=1}$.

5. Define definite integral as a limit of a sum. Evaluate

$$\lim_{n\to\infty}\left[\frac{n^2}{(n^2+1)^{3/2}}+\frac{n^2}{(n^2+2^2)^{3/2}}+\cdots+\frac{n^2}{\{n^2+(n-1)^2\}^{3/2}}\right].$$

6. Define gamma and beta functions. Write the relation between them. Evaluate the following integrals:

(i) $\int_0^1 x^4(1-\sqrt{x})^5\,dx$ (ii) $\int_0^1 x^4(1-\sqrt{x})^5\,dx$

7. (a) What is the formula to find the area bounded by the curve $y=f(x)$, the x-axis and the two fixed ordinates $x=a$ and $x=b$?

(b) Find the area of the quadrant of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ between the major and minor axes.

Scanned by CamScanner

Department ...

MATH-1124 : Calculus

Total Marks: 60 Time: 2.5 Hours

(Answer any Four (4) of the following Questions)

1. a) What do you mean by composition of a function with another function? Let f and g be two functions defined by $f(x) = x^2 + 2$ and $g(x) = \sqrt{x}$ 7

   (i) Find $(fog)(x)$ and $(gof)(x)$
   (ii) Compute the domains and ranges of fog and gof
   (iii) Sketch the graphs of fog and gof

   b) State L'Hopital's Rule of the form $\frac{0}{0}$. Compute 8

   (i) $\lim_{x \to \frac{\pi}{4}} (1 - \tan x) \sec 2x$

   (ii) $\lim_{x \to 0^+} \left(\frac{1}{x} - \frac{1}{\sin x} \right)$

2. a) (i) Compute $\frac{dy}{dx}$ if $(\cos y)^2 = (\sin x)^2$ 8

   (ii) Differentiate $e^{\sin^{-1} x}$ with respect to $\cos 3x$

   b) Find the radius and height of the right circular cylinder of largest volume that can be inscribed in a right circular cone with radius 6 inches and height 10 inches. 7

3. a) Let $y = \sin(p \sin^{-1} x)$. Find the relation among y_{n-2}, y_{n-1} and y_n 8

   b) Show that $\sqrt{y} - \sqrt{x} < \frac{y-x}{2\sqrt{x}}$ if $0 < x < y$ 7
   Using mean value theorem for Differential Calculus

4. a) Compute (any two) 7

   (i) $\int \frac{5x}{4x^2+5} dx$ (ii) $\int \tan^3 5x \sec^2 5x \, dx$

   (iii) $\int \frac{\sec^2(\sqrt{x})}{\sqrt{x}} dx$

   b) Compute (any two): 8

   (i) $\int_1^3 \frac{\cos^{-1} x}{x^2} dx$ (ii) $\int_0^{\frac{\pi}{2}} \sqrt{\tan\theta} \, d\theta$

   (iii) $\int_0^{\frac{\pi}{2}} \frac{dx}{5 + 3\cos x}$

5. a) State and prove First Fundamental Theorem of Calculus. 6

   b) What do you mean by improper integrals of first kind and second kind? Give examples. 4

   c) Compute the value of the improper integral 5

$$\int_{-\infty}^{\infty} \frac{dx}{1 + x^2}$$

6. a) Find the area of the region enclosed by the curves $y^2 = x$ and $y = x - 2$. 5

   b) Find the volume of the solid that results when the region enclosed by the curves $y = \sqrt{25 - x^2}$, $y = 3$ is revolved about the x-axis. 5

   c) Find the area of the region enclosed by the hypocycloid $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$

7. a) Find the area of the region bounded by $y = x^2$, $y = 2 - x$.

   b) Find the area of the surface of a solid generated by revolving the cycloid
   $x = a(\theta - \sin\theta)$
   $y = a(1 - \cos\theta)$ around $y = 0$

   c) Find the area bounded by the hypocycloid $(x/a)^{2/3} + (y/b)^{2/3} = 1$.

Scanned by CamScanner

Total Marks: 60 Time: 2.5 Hours

(Answer any Four (4) of the following Questions)

1. a) What do you mean by composition of a function with another function? Let f and g be two functions defined by $f(x) = x^2 - 7$ and $g(x) = \sqrt{x}$

   (i) Find $(fog)(x)$ and $(gof)(x)$
   (ii) Compute the domains and ranges of fog and gof.
   (iii) Sketch the graphs of fog and gof.

   b) State L'Hopital's Rule of the form $\frac{0}{0}$. Compute:

   (i) $\lim_{x \to \frac{\pi}{4}} (1 - \tan x) \sec 2x$

   (ii) $\lim_{x \to 0^+} \left(\frac{1}{x} - \frac{1}{\sin x}\right)$

2. a) (i) Compute $\frac{dy}{dx}$ if $(\cos y)^x = (\sin x)^y$

   (ii) Differentiate $e^{\sin^{-1} x}$ with respect to $\cos 3x$

   b) Find the radius and height of the right circular cylinder of largest volume that can be inscribed in a right circular cone with radius 6 inches and height 10 inches.

3. a) Let $y = \sin(p \sin^{-1} x)$. Find the relation among y_{n+2}, y_{n+1} and y_n

   b) Show that $\sqrt{y} - \sqrt{x} < \frac{y-x}{2\sqrt{x}}$ if $0 < x < y$ using mean value theorem for Differential Calculus.

4. a) Compute (any two):

   (i) $\int \frac{3x}{\sqrt{4x^2-5}} dx$

   (ii) $\int \frac{\sec^2(\sqrt{x})}{\sqrt{x}} dx$

   (iii) $\int \tan^3 5x \sec^2 5x \, dx$

   b) Compute (any two):

   (i) $\int_1^3 \frac{\cos\frac{\pi}{x}}{x^2} dx$

   (ii) $\int_0^{\frac{\pi}{2}} \frac{dx}{5+3\cos x}$

   (iii) $\int_0^{\frac{\pi}{2}} \sqrt{\tan\theta} \, d\theta$

5. a) State and prove First Fundamental Theorem of Calculus.

   b) What do you mean by improper integrals of first kind and second kind? Give examples.

   c) Compute the value of the improper integral

$$\int_{-\infty}^{\infty} \frac{dx}{1+x^2}$$

6. a) Find the area of the region enclosed by the curves $y^2 = x$ and $y = x - 2$.

   b) Find the volume of the solid that results when the region enclosed by the curves $y = \sqrt{25 - x^2}$, $y = 3$ is revolved about the x-axis.

   c) Find the area of the region enclosed by the hypocycloid $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$

Scanned by CamScanner

First Year First Semester B.Sc. Final Exam
Department of Computer Science and Engineering
MATH-1124 : Calculus

Total Marks: 60 **Time: 2.5 Hours**

(Answer any Four (4) of the following Questions)

1. a) Define function. What do you mean by domain and range of a function? Sketch and find the domain and range of the following functions. 7

i) $f(x) = \frac{x}{|x|}$ ii) $f(x) = \sqrt{x-3}$

b) Test the continuity and differentiability of a function $f(x)$ at a point $x = \frac{\pi}{2}$, 8

where $f(x) = \begin{cases} 1 & when\ x < 0 \\ 1 + sinx & when\ 0 \le x < \pi/2 \\ 2 + (x - \frac{\pi}{2})^2 & when\ x \ge \pi/2 \end{cases}$

2. a) Find the differential coefficient of the following functions: 6

i) $x = acos^3\theta,\ y = asin^3\theta$ ii) $y = \sin x^{cosx}$

iii) $f(x) = cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$

b) State and prove Leibnitz's theorem. If $x = \tan(lny)$, then prove that 9
$(1 + x^2)y_{n+2} + (2nx + 2x - 1)y_{n+1} + n(n+1)y_n = 0$

3. a) State L'Hospital's rules. Apply this rule to evaluate 7

i) $\lim_{x\to 0}\left(\frac{1}{x} - \frac{1}{e^x - 1}\right)$ ii) $\lim_{x\to 0}\left(\frac{e^x - e^{-x} - 2x}{x^2 sinx}\right)$

b) If $sin\,y = xsin(a+y)$, then prove that $\frac{dy}{dx} = \frac{sin^2(a+y)}{sina}$ 4

c) Find y_n for the function $y = \frac{1}{a-x}$ 4

4. a) Evaluate the following indefinite integrals (any two): 7

i) $\int \frac{1}{1+\sin\theta} d\theta$ ii) $\int \frac{dx}{2x^2+x+1}$ iii) $\int x^2\sqrt{x-1}\,dx$

b) Evaluate the following definite integrals (any two): 8

i) $\int_0^4 \frac{x^3}{\sqrt{x^2+9}}$ ii) $\int_1^2 |2x-3|dx$ iii) $\int_0^{10}\sqrt{10x - x^2}\,dx$

5. a) Prove that $\int_0^{\pi/2} sin^n x dx = \begin{cases} \frac{n-1}{n}.\frac{n-3}{n-2}.\frac{n-5}{n-4}\cdots\frac{3}{4}.\frac{1}{2}.\frac{\pi}{2}, & n\ is\ even \\ \frac{n-1}{n}.\frac{n-3}{n-2}.\frac{n-5}{n-4}\cdots\frac{4}{5}.\frac{2}{3}.1, & n\ is\ odd \end{cases}$ 8

Where n is a positive integer.

b) Obtain a reduction formula for $\int_0^{\pi/2} sin^p x cos^q x dx$ and hence evaluate $\int_0^{\pi/2} sin^6 x cos^5 x dx$. 7

6. a) Find the area of the region bounded by $y = x^2$, $y = 2 - x$. 5

b) Find the area of the surface of a solid generated by revolving the cycloid 5
$x = a(\theta - sin\theta)$
$y = a(1 - cos\theta)$ around $y = 0$

c) Find the area bounded by the hypocycloid $(x/a)^{2/3} + (y/b)^{2/3} = 1$. 5

Scanned by CamScanner

University of Dhaka
Department of Computer Science
First Year 1st Semester 2014-15 First Incourse Examination
Course No. MATH-1124 Calculus **Marks: 30**

Answer any 5 questions. All questions are of equal value. Time: 1 (One) hour.

1. (a) Define function. What do you mean by domain and range of a function? Sketch and find the domain and range of the following functions:

(i) $f(x)=\dfrac{x}{|x|}$ **(ii)** $f(x)=\sqrt{x-3}$

(b) What do you mean by $\lim\limits_{x\to a} f(x)$ **and** $f(a)$**?**

2. Test the continuity and differentiability of a function $f(x)$ **at a point** $x=1$**, where** $f(x)=|x|+|x-1|$.

3. (a) If $f(x)=\begin{cases}1+x, & x>0\\ 1-x, & x\le 0\end{cases}$ **does** $f'(0)$ **exist?**

(b) Differentiate $\tan^{-1}\dfrac{x}{\sqrt{1-x^2}}$ **with respect to** $\sec^{-1}\dfrac{1}{2x^2-1}$.

4. (a) Find $\dfrac{dy}{dx}$ **of the following:**

(i) $\boxed{x^y y^x=1}$ **(ii)** $y=\dfrac{\cos x-\sin x}{\sqrt{1-\sin 2x}}$ **(iii)** $y=\cos^{-1}\left(\dfrac{1-x^2}{1+x^2}\right)$ **(iv)** $y=\sin^3(\ln 2x^2)$

5. *State Leibnitz's theorem.* If $x=\tan(\ln y)$ **then prove that**

$$(1+x^2)y_{n+2}+(2nx+2x-1)y_{n+1}+n(n+1)y_n=0.$$

6. (a) State L' Hospitals rules hence evaluate

(i) $\lim\limits_{x\to 0}\left(\dfrac{1}{x}-\dfrac{1}{e^x-1}\right)$ **(ii)** $\lim\limits_{x\to 0}\dfrac{e^x-e^{-x}-2x}{x^2\sin x}$

(b) Find the intervals where the function $f(x)=x+\dfrac{16}{x}$ **is increasing and decreasing. Also find the local extrema of** $f(x)$.

Scanned by CamScanner

Mth 111-1124 : Calculus

Total Marks: 60

Time: 2.5 Hour

(Answer any Four (4) of the following Questions)

1. a) What do you mean by $\lim_{x\to a} f(x)$ and $f(a)$?

b) If $f(x) = \begin{cases} 1+x, & x > 0 \\ 1-x, & x \le 0 \end{cases}$ does $f'(0)$ exist? 5

c) Test the continuity and differentiability of a function $f(x)$ at a point $x = 1$, where $f(x) = |x| + |x-1|$. 8

2. a) Find the differential coefficient of the following functions: 9

i) $y = x^{\tan^{-1}x} + (\sin x)^{\log x}$

ii) $y = \frac{3at^2}{a+t^3}, x = \frac{3at}{1+t^3}$

iii) $y = \sin(e^x)\log x$

b) If $y = e^{a\sin^{-1}x}$, then show that, 6

$(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2+a^2)y_n = 0$

3. a) State and prove L'Hospital's rule. Apply this rule to evaluate 5

$$\lim_{x\to 0}\left(\frac{\tan x - \sin x}{2x^3}\right)$$

b) Differentiate $\tan^{-1}\frac{x}{\sqrt{1-x^2}}$ with respect to $\sec^{-1}\frac{1}{2x^2-1}$ 4

c) A 5 ft ladder, leaning against a wall, slips in such a way that its base is moving away from the wall at a rate of 2ft/sec at the instant when the base is 4 ft away from the wall. How fast is the top of the ladder moving down the wall at the instant? 6

4. a) Find the maximum and minimum values of 3

$$1 + 2\sin x + 3\cos^2 x, \quad 0 \le x \le \pi/2$$

b) State Taylor's series and Mean value theorem. Verify Mean value theorem for the function $f(x) = 2x - x^2$ in the interval (0,1). 3

c) Evaluate the following definite integrals: 9

i) $\int_0^4 \frac{x^3}{\sqrt{x^2+9}}$ ii) $\int_1^2 |2x-3|dx$ iii) $\int_0^{10}\sqrt{10x - x^2}\,dx$

5. a) Find the reduction formula for $I_n = \int \sin^n x\,dx$. Hence evaluate $\int \sin^5 x\,dx$ 8

b) Define definite integral as a limit of a sum. Evaluate 7

$$\lim_{n\to\infty}\left[\frac{n^2}{(n^2+1)^{3/2}} + \frac{n^2}{(n^2+2^2)^{3/2}} + \dots + \frac{n^2}{\{n^2+(n+1)^2\}^{3/2}}\right]$$

6. a) Find the area of the region enclosed by the curve $y = x^2$ and $y^2 = x$ using x as independent variable. 5

b) Find the length of the arc of the parabola $r(1+\cos\theta) = 2$ from $\theta = 0$ to $= \pi/2$. 5

c) Find the volume of the solid generated by revolving the region bounded by $y = \sqrt{x}$ and the lines $y = 1, x = 4$ about the line $y = 1$. 5

Scanned by CamScanner

University of Dhaka
Department of Computer Science and Engineering
First Year First Semester B.Sc. Final Examination: 2014
CSE-1101 : Computer Fundamentals

Time: 2.5 Hours

Total Marks: 60

[Answer any Four (4) of the following Questions]

1. a) Mention the features of the 4th generation computers. Why are the modern computers digital? 3
   b) Describe the six logical units of a computer. 3
   c) Define bus. Mention the types of buses. 2
   d) What are the advantages of RISC architecture over CISC architecture? 3
   e) Explain the steps of information processing cycle. 4

2. a) Describe working principle of a laser printer. 4
   b) Distinguish between a LCD monitor and a LED monitor. 3
   c) What happens when a key of a keyboard is pressed? 3
   d) What are the advantages of an optical mouse? 2.5
   e) Write a short note on digital camera. 2.5

3. a) Distinguish between EPROM and EEPROM. 2
   b) Write down the properties of DRAM. 3
   c) How data can be read from an optical disk? 3
   d) Distinguish between a CD and a DVD. 3
   e) Describe the structure of a hard disk and a hard disk drive. 4

4. a) Describe the types of system software. 4
   b) Mention the utility programs. 3
   c) Distinguish between machine language and high level language. 2.5
   d) Mention the properties of Linux 2.5
   e) Define ASCII code and Unicode. Mention the advantages of Unicode over ASCII code. 3

5. a) Write down the ten commandments defined by the computer ethics institute. 5
   b) Define network topology. Mention the main features of ring topology. 3
   c) Distinguish between guided and unguided transmission media. 3
   d) Mention the function of a bridge? What is a modem? 2
   e) Define network protocol. What is meant by SNMP? 2

6. a) It is said that open source software is more secured. Is it safe? Explain. 3
   b) How can we keep a computer virus free? 3
   c) How can we maintain network security? 3
   d) Define Virus, Trojan Horse and Worm. 3
   e) Describe the components of a CPU. 3

Biplab

Scanned by CamScanner

Total Marks: 60 Time: 2.5 Hours

(Answer any Four (4) of the following Questions)

1. a) What do you mean by composition of a function with another function? Let f and g be two functions defined by $f(x) = x^2 + 7$ and $g(x) = \sqrt{x}$ 7

   (i) Find $(fog)(x)$ and $(gof)(x)$

   (ii) Compute the domains and ranges of fog and gof.

   (iii) Sketch the graphs of fog and gof.

   b) State L'Hopital's Rule of the form $\frac{0}{0}$. Compute: 8

   (i) $\lim_{x \to \frac{\pi}{4}} (1 - \tan x) \sec 2x$

   (ii) $\lim_{x \to 0^+} \left(\frac{1}{x} - \frac{1}{\sin x}\right)$

2. a) (i) Compute $\frac{dy}{dx}$ if $(\cos y)^x = (\sin x)^y$ 8

   (ii) Differentiate $e^{\sin^{-1} x}$ with respect to $\cos 3x$

   b) Find the radius and height of the right circular cylinder of largest volume that can be inscribed in a right circular cone with radius 6 inches and height 10 inches. 7

3. a) Let $y = \sin(p \sin^{-1} x)$. Find the relation among y_{n-2}, y_{n+1} and y_n 8

   b) Show that $\sqrt{y} - \sqrt{x} < \frac{y-x}{2\sqrt{x}}$ if $0 < x < y$ using mean value theorem for Differential Calculus. 7

4. a) Compute (any two): 7

   (i) $\int \frac{3x}{\sqrt{4x^2+5}}\, dx$ (iii) $\int \tan^3 5x \sec^2 5x\, dx$

   (ii) $\int \frac{\sec^2(\sqrt{x})}{\sqrt{x}}\, dx$

   b) Compute (any two): 8

   (i) $\int_1^3 \frac{\cos^{-1} x}{x^2}\, dx$ (iii) $\int_0^{\frac{\pi}{2}} \sqrt{\tan\theta}\, d\theta$

   (ii) $\int_0^{\frac{\pi}{2}} \frac{dx}{5+3\cos x}$

5. a) State and prove First Fundamental Theorem of Calculus. 6

   b) What do you mean by improper integrals of first kind and second kind? Give examples. 4

   c) Compute the value of the improper integral 5

$$\int_{-\infty}^{\infty} \frac{dx}{1+x^2}$$

   (i) Find the area of the region enclosed by the curves $y^2 = x$ and $y = x - 2$ 5

   (ii) Find the volume of the solid that results when the region enclosed by the curves $y = \sqrt{25 - x^2}$, $y = 3$ is revolved about the x-axis. 5

   (iii) Find the area of the region enclosed by the hypocycloid $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ 5

Scanned by CamScanner

University of Dhaka
Department of Computer Science
First Year 1st Semester 2012-13 First Incourse Examination
Course No. MATH-1124 Calculus Marks: 30

Answer any 5 questions. All questions are of equal value. Time: 1 (One) hour.

1. (a) Define domain and range of a function $f(x)$. Given that $f(x) = -\sqrt{3-2x}$ find $f^{-1}(x)$ and sketch the graphs of f and f^{-1} hence, state the domain and range of f^{-1}.

(b) What do you mean by $\lim_{x \to a} f(x)$ and $f(a)$?

2. (a) Sketch the graphs of (i) $y = 3 - |2x - 4|$ (ii) $y = 3 + \sqrt{x+1}$ (iii) $y = x - 3|x| + 2$ and hence write down the domain and range for each of them.

(b) Find the rules for $f \circ g$ and $g \circ f$ then state the domain and range of them where $f(x) = x - 3$ and $g(x) = \sqrt{x^2 + 3}$.

3. (a) Evaluate the following limits:

(i) $\lim_{x \to 2} \dfrac{x^3 + 3x^2 - 12x + 4}{x^3 - 4x}$ (ii) $\lim_{x \to 0} \dfrac{\cos 2x - 1}{\cos x - 1}$

(b) If $f(x) = \begin{cases} 1 + x, & x > 0 \\ 1 - x, & x \le 0 \end{cases}$, does $f'(0)$ exist?

4. Test the continuity and differentiability of a function $f(x)$ at a point $x = 0$ and $x = \pi/2$ where

$$f(x) = \begin{cases} \sin x, & 0 \le x \le \pi/2 \\ 2 + (x - \pi/2)^2, & x \ge \pi/2 \end{cases}$$

5. Find the derivatives of the functions

(i) $y = \sin^3(\ln 2x^2)$ (ii) $y = \dfrac{3at^2}{1+t^3}$, $x = \dfrac{3at}{1+t^3}$ (iii) $y = x^{\tan^{-1} x} + (\sin x)^{\log x}$

(iv) $y = \sin^{-1}(3x - 4x^3)$

6. (a) State Leibnitz theorem. If $y = e^{a \sin^{-1} x}$, then show that,

$$(1 - x^2) y_{n+2} - (2n+1) x y_{n+1} - (n^2 + a^2) y_n = 0.$$

(b) A 5 ft ladder, leaning against a wall, slips in such a way that its base is moving away from the wall at a rate of 2 ft/sec at the instant when the base is 4 ft away from the wall. How fast is the top of the ladder moving down the wall at the instant?

Scanned by CamScanner

(Answer any Four (4) of the following Questions)

1. a) Define domain and range of a function f(x) with at least one example. Sketch and determine the domain and range of the following functions (any two): 7

(i) $f(x) = |x| + |x+1|$ (ii) $f(x) = \frac{1}{x^2-4}$ (iii) $f(x) = \sinh x$.

b) What do you mean by $\lim_{x\to a} f(x)$ and $f(a)$? Test the continuity and differentiability of a function $f(x)$ at a point $x = \pi/2$, where 8

$$f(x)\begin{cases} 1, & x < 0 \\ 1+\sin x, & 0 \le x < \frac{\pi}{2} \\ 2+\left(x-\frac{\pi}{2}\right)^2, & x \ge \frac{\pi}{2} \end{cases}$$

2. a) Find the differential coefficient $\frac{dy}{dx}$ of the following functions (any tow): 5

(i) $y = \tan \ln \sin (e^{x^2})$ (ii) $y = (2^x + x^2)^{f(x)}$ (iii) $x = \sin^{-1}\frac{2t}{1+t^2}, y = \tan^{-1}\frac{2t}{1-t^2}$

b) State Leibnitz's theorem. If $y = \tan^{-1} x$, then prove that 6

$(1+x^2)y_{n+2} + 2(n+1)xy_{n+1} + n(n+1)y_n = 0$.

c) A man is walking at the rate of 5 miles per hour towards the foot of a building 40 ft. high. At what rate is he approaching the top when he is 30 ft. from the foot of the building? 4

3. a) State Lagrange's Mean value theorem (MVT). Verify this theorem for $f(x) = x^3 - x - 4$ on the interval [-1, 2]. 5

b) Find the local extrema of $f(x) = x^4 - 8x^3 + 22x^2 - 24x + 5$. 5

c) State L'Hospital rule and compute $\lim_{x\to 0}\left(\frac{\tan x}{x}\right)^{\frac{1}{x}}$ 5

Biplob

4. a) Evaluate the following indefinite Integrals: any two 7

(i) $\int \cos^7 x\, dx$ (ii) $\int \frac{\sin x \cos x}{\cos^4 x + \sin^4 x} dx$ (iii) $\int \frac{dx}{2x^2+x+1}$

b) Evaluate the following definite integrals: 8

(i) $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}} dx$ (ii) $\int_0^4 \frac{x^3}{\sqrt{x^2+9}} dx$

5. a) State Taylor's theorem with remainder. Use Taylor's theorem to expand $f(x) = \frac{1}{x+1}$ in powers of x – 3. 7

b) If $I_n = \int \cos^n x\, dx$, then prove that $I_n = \frac{1}{n}\sin x \cos^{n-1} x + \frac{n-1}{n} I_{n-2}$. Hence evaluate $\int_0^{\frac{\pi}{2}} \cos^6 x\, dx$ 8

6. a) Find the area bounded by the parabolas $y^2 = 4ax$ and $x^2 = 4ay$. 5

b) Find the area of the surface generated by revolving the right hand loop of the lemniscate $r^2 = \cos 2\theta$ about the y-axis. 5

c) Find the length or perimeter of the circle $x^2 + y^2 = a^2$. 5

Scanned by CamScanner

(Answer any Four (4) of the following Questions)

1. a) What do you mean by composition of a function with another function? Let f and g be two functions defined by $f(x) = x^2 + 7$ and $g(x) = \sqrt{x}$ 7

(i) Find $(fog)(x)$ and $(gof)(x)$

(ii) Compute the domains and ranges of fog and gof.

(iii) Sketch the graphs of fog and gof.

b) State L'Hopital's Rule of the form $\frac{0}{0}$. Compute: 8

(i) $\lim_{x \to \frac{\pi}{4}} (1 - \tan x) \sec 2x$

(ii) $\lim_{x \to 0^+} \left(\frac{1}{x} - \frac{1}{\sin x}\right)$

2. a) (i) Compute $\frac{dy}{dx}$ if $(\cos y)^x = (\sin x)^y$ 8

(ii) Differentiate $e^{\sin^{-1} x}$ with respect to $\cos 3x$

b) Find the radius and height of the right circular cylinder of largest volume that can be inscribed in a right circular cone with radius 6 inches and height 10 inches. 7

3. a) Let $y = \sin(p \sin^{-1} x)$. Find the relation among y_{n+2}, y_{n+1} and y_n 8

b) Show that $\sqrt{y} - \sqrt{x} < \frac{y-x}{2\sqrt{x}}$ if $0 < x < y$ using mean value theorem for Differential Calculus. 7

4. a) Compute (any two): 7

(i) $\int \frac{3x}{\sqrt{4x^2+5}} dx$ (iii) $\int \tan^3 5x \sec^2 5x \, dx$

(ii) $\int \frac{\sec^2(\sqrt{x})}{\sqrt{x}} dx$

b) Compute (any two): 8

(i) $\int_1^3 \frac{\cos\frac{\pi}{x}}{x^2} dx$ (iii) $\int_0^{\frac{\pi}{2}} \sqrt{\tan\theta} \, d\theta$

(ii) $\int_0^{\frac{\pi}{2}} \frac{dx}{5+3\cos x}$

5. a) State and prove First Fundamental Theorem of Calculus. 6

b) What do you mean by improper integrals of first kind and second kind? Give examples. 4

c) Compute the value of the improper integral 5

$$\int_{-\infty}^{\infty} \frac{dx}{1+x^2}$$

6. a) Find the area of the region enclosed by the curves $y^2 = x$ and $y = x - 2$ 5

b) Find the volume of the solid that results when the region enclosed by the curves $y = \sqrt{25 - x^2}$, $y = 3$ is revolved about the x-axis. 5

c) Find the area of the region enclosed by the hypocycloid $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ 5

Scanned by CamScanner