

Khulna University
 Science, Engineering and Technology School
 Discipline: **Mathematics**, Program: **B.Sc. (Hons.)**
 Year: **First**, Term: **II** Examination-2026; Session: **2024-2025**
 Course Code: **0541 12 Math-1201**
 Course Title: **Geometry in Three Dimensions**
 Total Marks: **60**, Time: **03** Hours, Credit: **03**



- The figures in the margin indicate full marks. The questions are of equal value.
- Use separate answer script for each section.

Section-A

There are **FOUR** questions in this section. Answer any **THREE** questions

Marks

1. (a) Find the co-ordinates of the point in three-dimensional space which divides the straight line joining two given points in a given ratio. **04**
[L5; CLO1]

 (b) Calculate the ratio in which the yz plane divides join of the points $(-2, 4, 7)$ and $(3, -5, 8)$, and also find the co-ordinates of the point of intersection of this line with the yz plane. **04**
[L1; CLO1]

 (c) If P, Q, R are three points on the co-ordinate axes at distance p, q, r from origin O , determine the co-ordinates of the point which is equidistant from P, Q, R , and O . **02**
[L1; CLO1]

2. (a) Find the direction cosines l, m, n of two lines which are connected by the relations: **05**
 $l - 5m + 3n = 0$ and $7l^2 + 5m^2 - 3n^2 = 0$. [L5; CLO1]

 (b) The projections of a line on the axes are 3, 4, 12. Find the length and direction cosines of the line. **05**
[L6; CLO1]

3. (a) Obtain the equation of the plane which passes through the point $(-1, 3, 2)$ and is perpendicular to each of the two planes $x + 2y + 2z = 5$ and $3x + 2y + 2z = 8$. **05**
[L2; CLO1]

 (b) Find the distance of the point $(3, -4, 5)$ from the plane $2x + 5y - 6z = 16$ measured along a line with direction cosines proportional to $(2, 1, -2)$. **05**
[L6; CLO2]

4. (a) Find the equation of the plane containing the line $\frac{x+1}{-3} = \frac{y-3}{2} = \frac{z+2}{1}$ and the point $(0, 7, -7)$ and show that the line $x = \frac{7-y}{3} = \frac{z+7}{2}$ lies in the same plane. **05**
[L2; CLO2]

 (b) Find the magnitude and the equations of the line of shortest distance between the lines: **05**
 $\frac{x-3}{-1} = \frac{y-4}{2} = \frac{z+2}{1}; \frac{x-1}{1} = \frac{y+7}{3} = \frac{z+2}{2}$. [L1; CLO2]

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Section-B

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5. (a) Reduce the equation $3x^2 + 5y^2 + 3z^2 + 2yz + 2zx + 2xy - 4x - 8z + 5 = 0$ to the standard form and find the nature of the quadric. [L2; CLO2] 05
 (b) Show that the surface represented by the equation $26x^2 + 20y^2 + 10z^2 - 4yz - 16zx - 36xy + 52x - 36y - 16z + 25 = 0$ is an elliptic cylinder. Find the equation of its axis. [L2; CLO2] 05
6. (a) Define great circle and radical plane with examples. [L1; CLO5] 02
 (b) Find the equation of the tangent plane to a sphere $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$ at the point (x_1, y_1, z_1) . [L1; CLO5] 04
 (c) A plane passes through a fixed point (a, b, c) and cuts the axes in A, B, C . Show that the locus of the centre of the sphere $OABC$ is $\frac{a}{x} + \frac{b}{y} + \frac{c}{z} = 2$. [L1; CLO5] 04
7. (a) Show that the equation of the quadratic cone which contains the three coordinate axes and the straight lines in which the plane $x - 5y + 3z = 0$ cuts the cone $7x^2 + 5y^2 - 3z^2 = 0$ is $yz + 10zx - 18xy = 0$. [L3; CLO2] 05
 (b) Find the equation of the right circular cylinder whose guiding curve is the circle passing through the points $(1, 0, 0)$, $(0, 1, 0)$ and $(0, 0, 1)$. [L4; CLO3] 05
8. (a) Find the equations of the polar of the line $\frac{x-1}{5} = \frac{y-3}{7} = \frac{z+5}{2}$ with respect to the conicoid $x^2 + 3y^2 - 7z^2 - 21 = 0$ in symmetrical form. [L6; CLO4] 05
 (b) Find the equations of the two tangent planes which contain the lines given by $7x + 10y = 30$, $5y - 3z = 0$ and touches the ellipsoid $7x^2 + 5y^2 + 3z^2 = 60$. [L6; CLO4] 05

***** THE END *****

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 Year: **First**, Term: **II** Examination-2026; Session: **2024-2025**
 Course Code: **0541 12 Math-1205**
 Course Title: **Fundamentals of Mathematics-II**
 Total Marks: **60**, Time: **03** Hours, Credit: **03**



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Section-A

There are **FOUR** questions in this section. Answer any **THREE** questions

Marks

1. (a) Define Surds and Indices with example. Simplify the square root $28x^3$. [L4; CLO1] **04**
 (b) Simplify the radical, if possible, $3\sqrt{5} + \sqrt{20} - 2\sqrt{45}$. [L3; CLO2] **02**
 (c) The period (taken in seconds) of a pendulum of length L meters is given by, **04**

$$P = 2\pi \left(\frac{L}{9.8}\right)^{\frac{1}{2}}$$
 Determine the period P of this pendulum, if it has a length $\frac{58.8}{\pi}$ meters. [L5; CLO2]
2. (a) Illustrate the graph of the given function $f(x) = 2^{1-x}$. Also, Identify the domain and range of this function from the graph. [L3; CLO1] **05**
 (b) A sum of \$8000 is invested at an annual interest rate of 8%, compounded (i) yearly, (ii) half yearly. Find the total amount after 4 years with interest. [L1; CLO2] **05**
3. (a) Suppose that $f(x) = \log_2(x + 1) - 3$. **05**
 i. Find the domain of $f(x)$.
 ii. If $f(x) = -1$, determine the value of it? What point is on the graph of $f(x)$. [L5; CLO3]
 (b) Define absolute function. Determine the domain of the function, $f(x) = \ln\left(\frac{|x|-2}{x^2+1}\right)$ **05**
 [L5; CLO4]
4. (a) How many operations can you apply between two functions? Define composition of two functions. Express $h(x) = (x - 3)^3$ as a composition of two functions. [L3; CLO4] **04**
 (b) If x^n occurs in the expansion of $(x^2 + x^{-1})^{2n}$, then prove that its coefficient is **03**

$$\frac{(2n)!}{\left\{\frac{1}{3}(4n-p)\right\}! \left\{\frac{1}{3}(2n+p)\right\}!}$$
 [L5; CLO3]
 (c) Define implicit function. Find the implicit derivative of $\sin y = x \sin(a + y)$. **03**
 [L3; CLO3]

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Section-B

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5. (a) Explain the exponential constant 'e'. Prove that the value of 'e' lies between 2 and 3. 02
[L3; CLO5]
- (b) Prove that $e = \lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n$. 03
[L2; CLO5]
- (c) Explain inverse function and its properties. Draw the graph of six inverse trigonometry functions. 05
[L4; CLO5]
6. (a) Solve the rational inequality and show it by drawing graph of the solution in number line, $\frac{2}{x+1} - \frac{1}{x-1} \geq 0$ 05
[L3; CLO4]
- (b) Determine the maximum values of $z = 2x + y$, subject to the constraints $x + y \leq 5$, $2x + y \leq 6$, $y \geq 0$ and $x \geq 1$. 05
[L5; CLO5]
7. (a) i. If ${}^{18}C_r = {}^{18}C_{r+4}$, find ${}^{r+3}C_5$. 05
ii. If ${}^{2n}C_3 : {}^nC_2 = 44 : 3$, find the value of n . [L1; CLO1]
- (b) Find the number of ways in which an arrangement of 4 letters can be made from the letters of the word "INDEPENDENCE". 05
[L1; CLO5]
8. (a) Explain the following model, 05
(i) Population Model (ii) Radioactive Decay model [L2; CLO5]
- (b) Between 9:00 pm and 10:00 pm cars arrive at Burger King's drive-thru at the rate of 12 cars per hour. The Exponential Probability model can be used to determine the probability that a car will arrive within t minutes of 9:00 pm. 05
- i. Determine the probability that a car will arrive within 5 minutes of 9 pm (that is, before 9:05 pm).
- ii. Determine the probability that a car will arrive within 30 minutes of 9 pm (before 9:30 pm). [L5; CLO5]

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 Course Code: **0542 12 Stat 1153**
 Course Title: **Basic Statistics**
 Total Marks: **60**, Time: **03** Hours, Credit: **03**



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Section-A

There are **FOUR** questions in this section. Answer any **THREE** questions

Marks

- Define statistics. Explain the role of statistics in mathematical modelling. [L1; CLO2] **04**
 - What is the difference between descriptive and inferential statistics. [L3; CLO1] **03**
 - State the limitations of statistics and in what ways they mislead conclusion. [L3; CLO2] **03**
- Describe different methods for collecting primary data. [L1; CLO3] **03**
 - Describe the characteristics of an ordinal scale and explain how it differs from nominal scale. [L2; CLO2] **04**
 - Demonstrate the frequency distribution. Explain, with an example, the principle of constructing a frequency distribution. [L6; CLO3] **03**
- Compare and contrast between a histogram and a bar chart. [L3; CLO4] **03**
 - What are the advantages of diagrammatic presentation of statistical data over tabular presentation? [L3; CLO2] **03**
 - Two group of students Group A and Group B have obtained the following scores out of 100 in an examination. Display the data by a back-to-back stem and leaf plot. **04**

Group A	55	60	62	65	67	70	72	74	78	80
Group B	50	53	58	60	63	65	68	70	73	75

[L5; CLO4]

- For n non-zero observations, prove that $AM \geq GM \geq HM$. [L5; CLO4] **03**
 - Compute the median class from the following grouped data and interpret your result. **04**

Class	0-5	10-20	20-30	30-40	40-50
Frequency	5	8	12	6	4

[L4; CLO4]

- Find the two numbers whose arithmetic mean is 9 and geometric mean is 7. [L4; CLO3] **03**

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Section-B

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5. (a) Distinguish between quartile, percentile and decile. [L1; CLO4] 04
 (b) Describe the steps to calculate the median from a dataset that has an even number of items. [L2; CLO5] 03
 (c) Write some practical applications of percentile in real world data analysis. Interpret the meaning of $P_{75} = 0.85$. [L2; CLO5] 03
6. (a) Describe how a box plot represents and how it uses quartiles. [L4; CLO3] 03
 (b) Consider the following dataset of exam scores identify whether there are any outliers in this dataset using appropriate statistical method. [L5; CLO5] 04
- | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|-----|
| x_i | 30 | 45 | 50 | 52 | 55 | 60 | 62 | 65 | 70 | 85 | 110 |
|-------|----|----|----|----|----|----|----|----|----|----|-----|
- (c) What is the coefficient of variation? Write some of its characteristics. [L2; CLO5] 03
7. (a) Explain the difference between population variance and sample variance. [L2; CLO6] 03
 (b) Show that the sum of the deviations of each data point from its mean is zero. 03
 [L3; CLO6]
 (c) Ten boys each of 3 years old were weighed and the following weights in kg were obtained. Compute the mean deviation about the mean, median and arbitrary value 19. Interpret your results. [L4; CLO2] 04
- | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|
| x_i | 20 | 13 | 17 | 17 | 13 | 18 | 14 | 17 | 16 | 15 |
|-------|----|----|----|----|----|----|----|----|----|----|
8. (a) Define skewness and kurtosis. Show that kurtosis β_2 is independent of change of origin and change of scale. [L4; CLO6] 05
 (b) Establish the relationship between row moments and central moments and hence find the first four central moments. [L5; CLO6] 05

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 Course Code: **0542 12 Stat 1253**
 Course Title: **Probability Distribution**
 Total Marks: **60**, Time: **03** Hours, Credit: **03**



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Section-A

There are **FOUR** questions in this section. Answer any **THREE** questions

Marks

1. (a) Define the following terms with an example: (i) Deterministic experiment; (ii) Random experiment. [L1; CLO1] **02**
 (b) Define classical probability. How does it differ from empirical probability. [L1; CLO2] **03**
 (c) Develop the addition and condition law of probability. [L3; CLO1] **05**
2. (a) Define probability function and equally likely probability function? [L1; CLO1] **03**
 (b) Explain the following terms with example: i) Event space; ii) Mutually exclusive events and iii) Equally likely outcome. [L1; CLO1] **03**
 (c) In a city 55% of the population are male. It is known that 20% of the males and 30% of the females are unemployed. A research student studying the employment situation selects an unemployed person at random. What is the probability that the person selected is (i) male and (ii) female. [L2; CLO1] **04**
3. (a) Define prior probability and posterior probability with an example. [L1; CLO1] **03**
 (b) State and prove Bayes theorem. Also mention some practical uses of Bayes theorem. [L5; CLO1] **04**
 (c) Suppose that in a class 60% students are boy. Furthermore, suppose that 80% of boy's got mark more than 75%. (i) If a boy is selected at random from this class, what is the probability that he has a mark 75% or less? (ii) What percent of boys of this class got marks over 75%? [L4; CLO2] **03**
4. (a) Classify the variable types of the following variables: (i) Blood group; (ii) Height; (iii) Educational qualification; (iv) Age (in years); (v) Temperature ($^{\circ}\text{C}$); (vi) Times; (vii) Grading of a student; (viii) No. of defects; (ix) Obtained marks in the examination; and (x) Monthly income (in BDT). [L6; CLO3] **05**
 (b) Define probability mass function. Let X be a random variable with the following probability function: **05**

$X:x$	0	1	2	3	4	5	6	7
$P(x)$	0	c	$2c$	$2c$	$3c$	c^2	$2c^2$	$7c^2+c$

- (i) Find the value of c ; (ii) Evaluate $P[X \geq 5]$ and $P[X < 3]$; and (iii) Determine the distribution function of X . [L3; CLO3]

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Section-B

There are **FOUR** questions in this section. Answer any **THREE** questions

- | | | | |
|----|-----|---|----|
| 5. | (a) | Define probability density function. How does it differ from probability mass function?
[L2; CLO5] | 03 |
| | (b) | Is there any relationship between Bernoulli distribution and Binomial distribution? Also justify your answer.
[L5; CLO3] | 02 |
| | (c) | There are 50 questions, each with 4 alternative answers and only one is correct. Identify the probability that he will make 5 correct answers.
[L3; CLO2] | 02 |
| | (d) | In a class 70% students are boy. A student number is selected at random from this class. Find the expected number that the student is a boy.
[L4; CLO4] | 03 |
| 6. | (a) | Define Binomial distribution. Write down the properties of Binomial distribution.
[L1; CLO3] | 03 |
| | (b) | Find the mgf of Binomial distribution. Show that the mean of Binomial distribution always greater than its variance.
[L1; CLO3] | 04 |
| | (c) | Determine the binomial distribution for which mean is 4 and variance is 3. [L4; CLO3] | 03 |
| 7. | (a) | Define the Normal distribution. State its properties.
[L1; CLO6] | 03 |
| | (b) | Let X follows exponential distribution with having its cdf:
$F(x) = 1 - e^{-\frac{x}{\theta}}; x > 0, \theta > 0$
Find (i) the pdf of x; (ii) mean; (iii) variance; and (iv) standard deviation. [L2; CLO6] | 05 |
| | (c) | The heights of students are normally distributed with mean 170 cm and standard deviation 8 cm. Find the probability that a randomly selected student has height greater than 180 cm.
[L4; CLO6] | 02 |
| 8. | (a) | A study on a particle claims that the average lifespan of certain "X" particle is 2 years. The lifespan follows exponential distribution. Identify the rate parameter and graph the probability density function.
[L3; CLO4] | 03 |
| | (b) | Identify the median of Log-Normal Distribution.
[L3; CLO2] | 03 |
| | (c) | Define truncated normal and zero truncated binomial.
[L1; CLO3] | 04 |

***** THE END *****

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 Year: **First**, Term: **II** Examination-2026; Session: **2024-2025**
 Course Code: **0714 12 CSE 1255**
 Course Title: **Computer Programming I**
 Total Marks: **60**, Time: **03** Hours, Credit: **03**



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Section-A

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Marks

1. (a) Identify the invalid variable names from the given list and explain the reason where each one is considered invalid according to the rules of programming language being used. 05
 i) Minimum ii) First.name iii) n1+n2 iv) &name v) float vi) Sum Total
 vii) 3rd -row viii) area [L2; CLO2]
- (b) Why should 'goto' be avoided? [L2; CLO2] 02
- (c) Write a C program that takes the **CGPA** and the **number of credits** completed by a student and prints whether the student is eligible for a scholarship and of what percentage. To be eligible for a scholarship, a student must have completed at least 30 credits and earned a CGPA greater than or equal to 3.8. If not, please print "The student is not eligible for a scholarship". [L3; CLO2] 03

CGPA	Scholarship percentage
3.80 - 3.89	25 percent
3.90 - 3.94	50 percent
3.95 - 3.99	75 percent
4.00	100 percent

Sample Input	Sample Output
3.93 78	The student is eligible for a scholarship of 50 percent.
3.79 24	The student is not eligible for a scholarship.

2. (a) Develop a program that takes an integer n as input and determines whether it is a prime number or not by applying appropriate logic. [L3; CLO3] 05
- (b) What is the difference between $++m$ and $m++$? Explain with an example. [L2; CLO1] 02
- (c) What would be the output of the following code segments? [L4; CLO2] 03

i) int i=100; do{ i/=50; printf("%d\n",i); }while(i>99);	ii) int i,j=5,k=2; for(i=10;i<100;i++){ k=(k*j)-j; if(k>=20) break; printf("%d\n",k); }	iii) int i=5; while(i<15){ if(i%5!=0) continue; printf("%d ",i); i++; }
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3. (a) Write a C program to print those numbers between 1 and 1000 in which the sum of the digits is equal to or less than 10. For example, 99 will not be printed because $9+9 = 18$ is greater than 10, and 100 will be printed because $1+0+0 = 1$ is less than 10. [L6; CLO3] 04
- (b) Write a C program that takes a positive integer entered by the user and displays it in reverse order (digit by digit, reversed). [L6; CLO3] 04

Sample Input	Sample Output
1234	4321
100	1

- (c) (a) Convert the following C-code snippet from a do-while loop to a for loop: [L3; CLO2] 02

```
int i = 100;
do{
    printf("%d\n", i);
```

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i--;

}while(i>0);

4. (a) Write a C program that reads a string from the keyboard and determines whether the string is a palindrome or not. [L4; CLO3] 06

Note: A string is a palindrome if it can be read from left to right and right to left with the same meaning. For example, 'madam' and 'anna' are palindrome strings.

Sample Input	Sample Output
a1221a	Palindrome
23344	Not Palindrome

- (b) Write a C program that calculates the Greatest Common Divisor (GCD) of two positive integers entered by the user. [L3; CLO3] 04

Note: The GCD of two integers is the largest positive integer that divides both numbers without leaving a remainder.

Sample Input	Sample Output
48 18	6
100 75	25

Section-B

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5. (a) The numbers in the sequence 1 1 2 3 5 8 13 21... are called Fibonacci numbers. Write a C program to calculate and print the first **n** Fibonacci numbers. [L3; CLO3] 05
 (b) What is prototyping? Why is it necessary? [L1; CLO1] 02
 (c) You will be given 3 sides as input from the user. Write a C program to check whether it's a Pythagorean triplet or not. [Hints: A Pythagorean triple consists of three positive integers a, b, and c such that $a^2 + b^2 = c^2$.] [L5; CLO2] 03

Sample Input	Sample Output
3 4 5	Pythagorean Triplet
5 12 13	Pythagorean Triplet
4 5 6	Not A Pythagorean Triplet

6. (a) Write a C program that prints a descending number triangle pattern using nested loops. [L3; CLO3] 05

Sample Input	Sample Output
4	4 3 2 1 3 2 1 2 1 1

- (b) What is recursion? Write a recursive function in C to calculate the sum of the first N natural numbers. [L3; CLO2] 05

7. (a) Write a C program to take input of 100 positive integer numbers in an array. Then, using this array, display only those numbers that are less than the maximum value of the first 50 values. [L4; CLO3] 05

- (b) Write a C program that takes a string as input from the user and counts the number of vowels (a, e, i, o, u — both uppercase and lowercase) in it using a function. The function should return the count, and the main function should print the result. [L3; CLO3] 05

Sample Input	Sample Output
Hello World	Number of vowels: 3

8. (a) Develop a program that will take 3 numbers a, b, c as input and find out the roots of the quadratic equation $ax^2 + bx + c = 0$. [L5; CLO3] 03
 (b) Develop a program to calculate the following series up to n^{th} term. n will be taken from user. $1 + (1+4) + (1+4+7) + (1+4+7+10) + \dots + (1+4+7+\dots+3n-2)$ [L5; CLO3] 03
 (c) Construct a program that opens a file named input.text in reading mode, reads 100 integers from the file, sorts them in descending order, saves the sorted numbers in a file named desc.text and closes the files properly. [L5; CLO2] 04

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 Year: **First**, Term: **II** Examination-2026; Session: **2024-2025**
 Course Code: **0533 12 Phy 1251**
 Course Title: **Heat and Thermodynamics**
 Total Marks: **60**, Time: **03** Hours, Credit: **03**



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Section-A

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Marks

- | | | | |
|----|-----|---|----|
| 1. | (a) | What are the reason behind the mercury use in liquid galss thermometers? [L1; CLO1] | 03 |
| | (b) | Describe Callender and Griffith's bridge for the accurate measurement of resistance. [L4; CLO2] | 04 |
| | (c) | The rsistance of a platinum wire at 0°C, 100°C and 444.7°C is found to be 5.5, 7.5 and 14.5 ohms respectively. The resistance of a wire at temperature t°C is given by the equation $R_t = (1 + \alpha t + \beta t^2)$, evalute of α and β . [L5; CLO2] | 03 |
| | | | |
| 2. | (a) | Calculate the root mean square velocity of the molecules of hydrogen. [L4; CLO3] | 02 |
| | (b) | Develop a relation between pressure with densiyt and root-mean-square velocity of a perfect gas enclosed in a vessel. [L3; CLO3] | 04 |
| | (c) | Calculate the r.m.s velocity of the oxygen molecules at 31°C.[L3; CLO3] | 04 |
| | | | |
| 3. | (a) | What are the resons for modification of gas equation? [L1; CLO3] | 02 |
| | (b) | Mathematically explin the correction of volume of Van der Waals equation of state. [L2; CLO6] | 04 |
| | (c) | Compare Van der Waals equation of state with experimental PV curves. [L4; CLO3] | 04 |
| | | | |
| 4. | (a) | What are the properties of thermal radiation? [L1; CLO5] | 02 |
| | (b) | Show thermodynamical proof of Stefan-Boltzman law. [L2; CLO5] | 04 |
| | (c) | Deduce the temperature at which a black bosdy loses thermal energy at the rate of 1w/cm. Given $\sigma = 5.672 \times 10^{-8}$ SI units. [L5; CLO5] | 04 |

*Levels of Bloom's cognitive domain:

[L1=Remember; L2=Understand; L3=Apply; L4=Analyze; L5=Evaluate; L6=Create]

Section-B

There are **FOUR** questions in this section. Answer any **THREE** questions

- | | | | |
|----|-----|---|----|
| 5. | (a) | State and explain the significance of the zeroth law of thermodynamics. [L2; CLO6] | 03 |
| | (b) | Deduce Mayer's relation. [L5; CLO6] | 04 |
| | (c) | A motor car tyre has a pressure of 2 atmospheres at the room temperature of 27°C. If the tyre suddenly bursts, evaluate the resulting temperature. [L5; CLO6] | 03 |
| 6. | (a) | State and write the mathematical form of the first law of thermodynamics. [L3; CLO6] | 03 |
| | (b) | Distinguish between open, closed, and isolated systems. [L4; CLO6] | 04 |
| | (c) | State the second law of thermodynamics. [L2; CLO6] | 03 |
| 7. | (a) | State and prove Carnot's theorem. Obtain expressions for the work done in each operation of the Carnot cycle and the net work done in the cycle. [L5; CLO6] | 05 |
| | (b) | An engine works in a Carnot cycle between the temperatures 1000 °C and 150 °C. If the work done in each cycle is 400 kilogram-metres, how much heat, measured in calories, is taken in at the upper temperature? [L4; CLO6] | 05 |
| 8. | (a) | What is the difference between a heat engine and a refrigerator? [L1; CLO7] | 03 |
| | (b) | Define entropy. Derive its physical significance. [L2; CLO7] | 03 |
| | (c) | Discuss principle of regenerative cooling and its experimental arrangement. [L6; CLO7] | 04 |

***** THE END *****

*Levels of Bloom's cognitive domain:

[L1=Remember; L2=Understand; L3=Apply; L4=Analyze; L5=Evaluate; L6=Create]

Khulna University
Science, Engineering and Technology School
Discipline: **Mathematics**, Program: **B.Sc. (Hons.)**
Year: **First**, Term: **II** Examination-2026; Session: **2024-2025**
Course Code: **0311 12 Econ 1259**
Course Title: **Principles of Economics**
Total Marks: **60**, Time: **03** Hours, Credit: **03**



- The figures in the margin indicate full marks. The questions are of equal value.
- Use separate answer script for each section.

Section-A

There are **FOUR** questions in this section. Answer any **THREE** questions

Marks

- | | | | |
|----|-----|--|----|
| 1. | (a) | Define economics. Interpret the scope of economics. [L2; CLO1] | 05 |
| | (b) | Discuss three types of economic systems. [L1; CLO1] | 05 |
| 2. | (a) | Define demand. Based on a hypothetical demand schedule, draw a demand curve. [L3; CLO4] | 03 |
| | (b) | Compare shift in demand and movement along demand in graph and interpret. [L2; CLO4] | 03 |
| | (c) | With the help of demand and supply curve, show the process of determining market equilibrium and explain. [L5; CLO5] | 04 |
| 3. | (a) | Interpret the paradox of value context in our real-life phenomena. [L2; CLO2] | 05 |
| | (b) | Explain the characteristics of indifference curve. [L5; CLO2] | 05 |
| 4. | (a) | Graphically present three type of returns to scale. [L3; CLO3] | 05 |
| | (b) | Show law of variable proportion in three stages of production. [L5; CLO5] | 05 |

Section-B

There are **FOUR** questions in this section. Answer any **THREE** questions

- | | | | |
|----|-----|--|----|
| 5. | (a) | Distinguish between Gross National Product (GNP) and Net National Product (NNP). [L4; CLO1] | 03 |
| | (b) | Critically discuss the 'circular flow of income and expenditure model' with examples. [L6; CLO3] | 05 |
| | (c) | Define disposable income with examples. [L5; CLO1] | 02 |
| 6. | (a) | Distinguish inflation and deflation. Cite. [L3; CLO4] | 02 |
| | (b) | Differentiate long run and short run aggregate supply curve. [L3; CLO6] | 05 |
| | (c) | Describe the types of inflation. [L2; CLO6] | 03 |
| 7. | (a) | Illustrate the functions of money. [L3; CLO7] | 05 |
| | (b) | Write the functions of Bangladesh Bank. [L2; CLO2] | 05 |
| 8. | (a) | Analyze the problems and prospects of industrial sector of Bangladesh. [L4; CLO1] | 05 |
| | (b) | Write the causes and consequences of unemployment. [L3; CLO3] | 05 |

***** THE END *****

*Levels of Bloom's cognitive domain:

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Khulna University
 Science, Engineering and Technology School
 Discipline: **Mathematics**, Program: **B.Sc. (Hons.)**
 Year: **First**, Term: **II** Examination-2026; Session: **2024-2025**
 Course Code: **0541 12 Math-1203**
 Course Title: **Integral Calculus**
 Total Marks: **60**, Time: **03** Hours, Credit: **03**



- The figures in the margin indicate full marks. The questions are of equal value.
- Use separate answer script for each section.

Section-A

There are **FOUR** questions in this section. Answer any **THREE** questions

Marks

1. Evaluate the integrals: i) $\int \sin^{-1} \sqrt{\frac{x}{x+a}} dx$, ii) $\int \frac{4e^x + 6e^{-x}}{9e^x - 4e^{-x}} dx$ iii) $\int x^2 \log x dx$ **10**
 iv) $\int \frac{dx}{(a \sin^2 x + b \cos^2 x)^2}$, v) $\int e^x (\tan x - \log \cos x) dx$. [L5; CLO1]

2. (a) Define integration with the geometrical meaning. [L1; CLO1] **02**
 (b) Obtain a reduction formula for $\int \sin^m x \cos^n x dx$ and apply it to find $\int \sin^{11} x \cos^9 x dx$. **05**
[L1; CLO1]
 (c) Find a function $f(x)$ such that $f''(x) = x + \cos x$, whereas $f(0) = 1$, and $f'(0) = 2$. **03**
[L1; CLO1]

3. (a) State and prove the fundamental theorem of calculus. [L5; CLO2] **04**
 (b) Evaluate $\int_a^b \cos x dx$ as the limit of a sum. [L1; CLO2] **03**
 (c) Apply the concept of the definite integral as the limit of a Riemann sum to evaluate **03**
 $\lim_{n \rightarrow \infty} \left(\frac{n}{n^2+1^2} + \frac{n}{n^2+2^2} + \frac{n}{n^2+3^2} + \dots + \frac{n}{n^2+n^2} \right)$. [L5; CLO2]

4. (a) Evaluate the following definite integrals: **04**
 i) $\int_0^{\frac{\pi}{2}} \frac{\sin 2\theta}{\sin^4 \theta + \cos^4 \theta} d\theta$; ii) $\int_0^{\frac{\pi}{2}} \log(\sin x) dx$. [L5; CLO3]
 (b) Using the properties of definite integrals, integrate: **06**
 i) $\int_0^{\frac{\pi}{2}} \log|\tan x| dx$, ii) $\int_0^{\frac{\pi}{2}} \frac{\sin x - \cos x}{1 - \sin x \cos x} dx$, and iii) $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\tan x}}{1 + \sqrt{\tan x}} dx$ [L4; CLO3]

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Section-B

There are **FOUR** questions in this section. Answer any **THREE** questions

- | | | | |
|----|-----|---|------------------|
| 5. | (a) | Draw the graph of the parametric equations $x = \cos 2t$, $y = \sin 2t$. | [L1; CLO3] 02 |
| | (b) | Determine the area enclosed by the curves $y = x^2$ and $y = \sqrt{x}$, where, $x = \frac{1}{4}$,
and $x = 1$. | 04
[L5; CLO3] |
| | (c) | Apply the concept of polar integration and the symmetry of polar curves to determine the area enclosed by one loop of the curve $r = \sin 3\theta$. | 04
[L3; CLO3] |
| 6. | (a) | Prove that the circumference of a circle of radius R is $2\pi R$ using the definite integral for the arc length of a curve. | 03
[L5; CLO4] |
| | (b) | Obtain the surface area of the solid generated by revolving the cardioid
$r = 5(1 + \cos \theta)$ about the initial line. | 04
[L4; CLO4] |
| | (c) | Show that the length of the curve $x^2 = a^2 \left(1 - e^{\frac{y}{a}}\right)$ measured from $(0, 0)$ to (x, y) is
$a \log \left(\frac{a+x}{a-x}\right) - x$. | 03
[L2; CLO4] |
| 7. | (a) | Derive the formula for the right pyramid whose altitude is h and the base is a square with sides of length l . | 05
[L2; CLO4] |
| | (b) | Show that the volume of the solid obtained by revolving the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ about the y -axis is $\frac{400\pi}{3}$. | 05
[L2; CLO4] |
| 8. | (a) | Define gamma and beta functions. Deduce the relationship between gamma and beta functions. | 04
[L1; CLO5] |
| | (b) | Integrate $\int_0^1 \frac{dx}{(1-x^8)^{\frac{1}{8}}}$ by using gamma-beta function. | 03
[L3; CLO5] |
| | (c) | Examine the convergence of the improper integral $\int_0^\infty \frac{dx}{x \ln x}$. | 03
[L5; CLO5] |

***** THE END *****

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[L1=Remember; L2=Understand; L3=Apply; L4=Analyze; L5=Evaluate; L6=Create]