**Khulna University, Khulna**

Date: 15/07/2026

**First** Year, **First** Term Examination
Session: **2025-2026**
Electronics and Communication Engineering Discipline
Course No.: **0531 09 Chem 1175**
Full Title of Course: **Chemistry**
Full Marks: **60** Time: **03** Hours Credit: **2.0**

* **The figures in the margin indicate full marks. The questions are of equal value.**
* **Use separate sheet for each section.**

## Section A

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

| | | | |
|---|---|---|---|
| 1. | (a) | Describe Rutherford's gold foil experiment and explain how its observations led to the discovery of the atomic nucleus. [L2, CLO 2] | 4 |
| | (b) | State Hund's Rule, Pauli's exclusion principle, and Azimuthal quantum number with an example. [L1, CLO 1] | 6 |
| 2. | (a) | What is meant by the electronegativity of an element, and how does it vary with atomic volume? [L1, CLO 2] | 3 |
| | (b) | Explain the following terms: (i) Co-ordinate bond; and (ii) Metallic bond. [L2, CLO 2] | 3 |
| | (c) | Show the major applications of noble gases. [L2, CLO 3] | 4 |
| 3. | (a) | Explain the preparation of N-type and P-type semiconductors, including the dopants used and their effects on the electrical properties of the semiconductors. [L6, CLO 3] | 5 |
| | (b) | Write a note on "Claisen condensation" and "Wurtz–Fittig reaction". [L1, CLO 1] | 5 |
| 4. | (a) | Explain the following terms: (i) Mole fraction, (ii) Molality, and (iii) Normality. [L4, CLO 2] | 1.5× 3 |
| | (b) | How to prepare 200 mL of a 0.540 M NaOH solution? [L1, CLO 2] | 3 |
| | (c) | Determine the molarity and molality of a 13% (w/w) sulfuric acid ($H_2SO_4$) solution, given that its density is 1.09 g/mL. [L5, CLO 2] | 2.5 |

## Section B

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

5. (a) Interpret the working of a simple voltaic (galvanic) cell using the zinc-copper system. Identify the anode and cathode reactions and explain the role of the salt bridge. [L2, CLO 1] — 4

   (b) The standard reduction potentials are: $Zn^{2+}/Zn = -0.76$ V and $Cu^{2+}/Cu = +0.34$ V. — 3+3

   (i) Calculate the standard EMF of the Zn-Cu cell. (ii) Using the Nernst equation, calculate the EMF at 25°C when $[Zn^{2+}] = 0.001$ M and $[Cu^{2+}] = 0.1$ M. [L3, CLO 3]

6. (a) Explain the mechanism of forming Na and chlorine gas ($Cl_2$) via electrolysis with the example of NaCl. Identify the reactions at the anode and cathode. [L2, CLO 1] — 4

   (b) A current of 2.5 amperes is passed through a copper sulphate solution for 60 min. (i) Calculate the quantity of electricity passed. (ii) Calculate the mass of copper deposited at the cathode. [Electrochemical equivalent of Cu = 0.0003296 $gc^{-1}$]. [L3, CLO 3] — 3+3

7. (a) Identify whether it is an exothermic or endothermic process in the following example: — 0.5×4

   (i) Melting ice cubes, (ii) Rusting iron, (iii) Formation of snow, (iv) Cooking an egg. [L1, CLO 1]

   (b) Briefly describe a measurement technique for the heat of reaction. [L2, CLO 2] — 4

   (c) The following thermochemical equations are given: — 4

   (i) $C(s) + O_2(g) \rightarrow CO_2(g)$; $\Delta H = -394$ kJ/mol

   (ii) $CO(g) + \frac{1}{2}O_2(g) \rightarrow CO_2(g)$; $\Delta H = -283$ kJ/mol.

   Calculate the standard enthalpy of formation of carbon monoxide (CO) for the reaction: $C(s) + \frac{1}{2}O_2(g) \rightarrow CO(g)$; $\Delta H$ =? [L5, CLO 2]

8. (a) Define pOH. Calculate the pH and pOH of: [L3, CLO 1] — 1.5×2

   (i) 0.05 M $H_3PO_4$ solution (ii) 0.02 M $Mg(OH)_2$ solution

   (b) For the decomposition of $H_2O_2$, the following titration data were obtained using standard — 4

   $KMnO_4$: t (min): 0 10 20

   Vol $KMnO_4$ (mL): 25.0 15.5 9.6

   Using the integrated first-order rate equation, verify that the decomposition is first order and calculate the rate constant k. [L3, CLO 2]

   (c) Justify the statement that molecularity and reaction order are distinct concepts in chemical kinetics. [L5, CLO 3] — 03

**Khulna University, Khulna**

Date: 21/07/2026

**First** Year, **First** Term Examination
Session: **2025-2026**
Electronics and Communication Engineering Discipline
Course No.: **0714 09 CSE 1151**
Full Title of Course: **Structured Programming**
Full Marks: **60** Time: **03** Hours Credit: **3.0**

* **The figures in the margin indicate full marks. The questions are of equal value.**
* **Use separate sheet for each section.**

**Section A**

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

1.(a) Why do we use **#include** and **#define**? Write a C program that takes three numbers as input and prints them in ascending order without using any array or built-in function. [CLO1; L1] 03

1.(b) Define C tokens. Write down the differences between the following terms: [CLO1; L2] 03

i. Keywords and identifiers
ii. Variables and constants
iii. Character and string.

1.(c) Write a C program to calculate the mean, variance, and standard deviation of N numbers entered by the user. [CLO2; L3] 03

1.(d) What is the output of the following code? [CLO4; L4] 01

```
void main()
{
  int a = 5;
  int b = a++ + ++a + a;
  printf("%d ",b);
}
```

2.(a) Write a program that takes an integer input and checks if it's a Harshad number (divisible by the sum of its digits). [CLO2; L3] 04

2.(b) Determine the value (True/False) of each of the following logical expressions if `a=5`, `b=10`, and `c=-6`. [CLO3; L4] 04

```
i) a<b && a>c
ii) a==c || b>a
iii) b>15 && c<0 || a>0
iv) (a/2.0==0.0 && b/2.0 !=0.0) || c<0.0
```

2.(c) Write down the working principle of the **else if** ladder with syntax, diagram, and proper example. [CLO3; L2] 02

3.(a) Construct a C Program to find the LCM of two Numbers. [CLO2; L3] 04

3.(b) Design a program that takes an integer value (any length) as input and outputs the cube sum of all digits of the integer. [CLO3; L6] 04

3.(c) What would be the output of the following code segments? [CLO2; L1] 02

```
i. float t=10.0;
do
{
    t = t/2;
    printf("%f ", t);
}while(t>2);
```

```
ii. int a=10, b=20, c;
c = (a>b) ? a : b;
printf(" %d ",c);
```

4.(a) Print the following triangle using C. [CLO4; L6] 05

```
1 2 3 4 5
1 2 3 4
1 2 3
1 2
1
```

4.(b) Write a C program that reads N integers into an array and prints all elements that appear more than once. [CLO3; L3] 05

## Section B

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

5.(a) Take input N and generate the following pyramid of digits using nested loops in C programming. If N=4: [CLO4; L6] 04

```
1 1 1 1 1 1 1
 0 0 0 0 0
   1 1 1
    0
```

5.(b) Write a C program to take input of 200 positive integer numbers in an array. Then, using this array, display only those numbers that are greater than the average of all 200 values. [CLO4; L3] 04

5.(c) What is the output of the following program? [CLO3; L4] 02

```
int a[]={1,2,3,4,5]
int x,y=0;
for(x=0; x<5; x++)
y=y+a[x];
printf("%d",y);
```

6.(a) Write a C program to find the product of all prime digits present in a given integer number. [CLO3; L3] 05

If no prime digits exist, display "No prime digit found."

Example: Input: 45219 → Output: $2 \times 5 \times 2 = 20$

Input: 4680 → Output: No prime digit found

6.(b) Write a C program to find the sum of the following series: [CLO4; L3] 05

$$x - \frac{x^3}{2!} + \frac{x^5}{3!} - \frac{x^7}{4!} + \cdots$$

7.(a) Build a program to remove vowels from a given string. [CLO1; L3] 04

7.(b) Write a C program to find the sum of both diagonals of a square matrix (any order). [CLO4; L6] 06

8.(a) Write a C program to find the length of a string without using `strlen()`. [CLO4; L3] 04

8.(b) Define a function `int gcdSum(int a, int b)` that returns the sum of digits of the GCD of two numbers. [CLO3; L4] 04

Example: `a=36, b=60 → gcd=12 → output=1+2=3.`

8.(c) Explain call by value and call by reference with an example. [CLO2; L4] 02

Date: 12/07/2026

**Khulna University, Khulna**

**First** Year, **First** Term Examination
Session: **2025-2026**
Electronics and Communication Engineering Discipline
Course No.: **0714 09 ECE 1101**
Full Title of Course: **Electrical Circuits I**
Full Marks: **60** Time: **03** Hours Credit: **3.0**

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

## Section A

There are **Four** questions in this section. Answer any **Three** questions.

1(a) What is the total cost of using all the followings at 12 Taka per kilowatt-hour? A 1200 $W$ toaster for 30 min, six 50 $W$ bulbs for 4 h, a 500 $W$ washing machine for 45 min, a 4300 $W$ electric clothes dryer for 20 min, and an 80 $W$ PC for 6 h. [L-2; CLO-1] 03

1(b) For the series circuit in Fig. 1(b), ***a)*** Find the total resistance $R_T$ , ***b)*** Calculate the resulting source current $I_s$, and ***c)*** Determine the voltage across each resistor. [L-3; CLO-1] 03

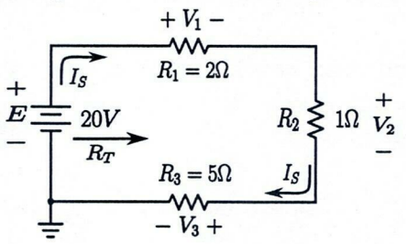



Fig. 1(b)

1(c) Design the voltage divider circuit in Fig. 1(c) such that the voltage across $R_1$ will be four times the voltage across $R_2$; that is, $V_{R_1} = 4V_{R_2}$ [L-3; CLO-2] 04

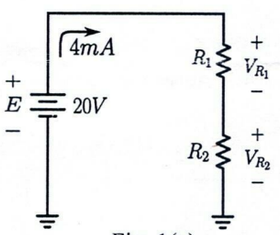



Fig. 1(c)

2(a) Find the equivalent resistance (seen from the side of the voltage source) of the circuit as shown in Fig. 2(a) using Star/Delta conversion [L-3; CLO-2] 05

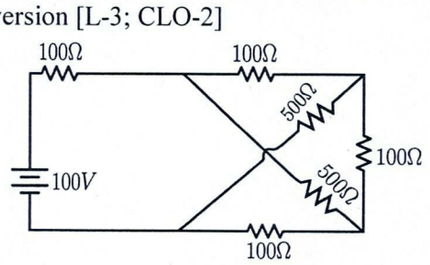



Fig. 2(a)

2(b) Using Supermesh analysis, determine the currents of the network in Fig. 2(b) [L-3; CLO-2] 05

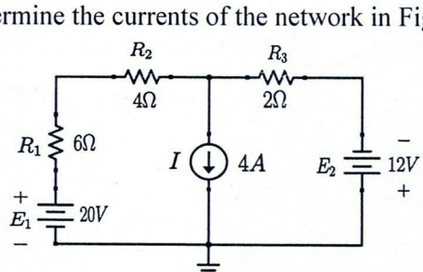



Fig. 2(b)

3(a) Using the Superposition theorem, determine the current $I_2$ through the resistor $R_2$ for the network shown in Fig. 3(a). What will be the value of the power across resistor $R_2$ if you use superposition theorem. [L-3; CLO-2] 05

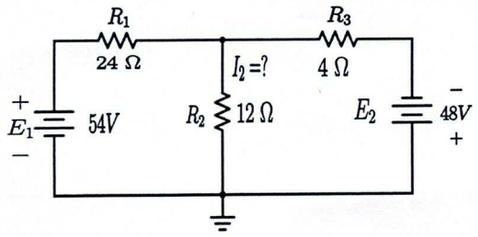



Fig. 3(a)

3(b) Determine the current $I$ in the network shown in Fig. 3(b) by using Thevenins theorem. [L-3; CLO-2] 05

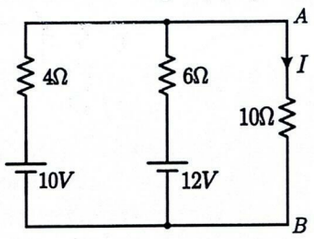



Fig. 3(b)

4(a) What is the purpose of a 'reference node' in Nodal analysis? Using Nodal analysis, determine the potential and current across 4 Ω resistor, shown in the network in Fig. 4(a). [L-3; CLO-2] 05

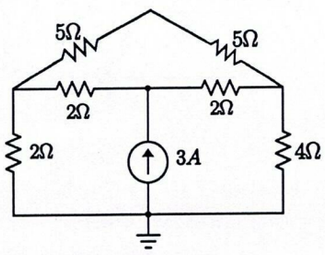



Fig. 4(a)

4(b) Find the Norton equivalent circuit for the network external to the $R_L = 9\ \Omega$ resistor in Fig. 4(b). [L-3; CLO-2] 05

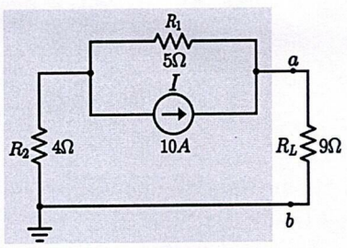



Fig. 4(b)

## Khulna University, Khulna

### Section B

**There are Four questions in this section. Answer any Three questions.**

5(a) Sketch the following waveforms, and then identify which wave is leading and which wave is lagging? [L-2; CLO-1] 02

$(i)\ 50\sin(\omega t + 0°)$ $(ii)\ 5\sin(\omega t + 120°)$

$(iii)\ 2\cos(\omega t + 10°)$ $(iv)\ -2\sin(\omega t + 10°)$

5(b) Briefly explain why the sinusoidal current leads the applied sinusoidal voltage by exactly 90° in a purely capacitive circuit. [L-2; CLO-1] 02

5(c) Perform the following operations, and express your answer in both rectangular and polar forms: [L-3; CLO-1] 03

$$(i)\ \frac{(2\angle 20°)^2(3+j4)}{8-j6} \qquad (ii)\ \frac{(6\angle 20°)(120\angle -40°)(3+j8)}{2\angle -30°}$$

5(d) For the waveform of Fig. 5(d) [L-4; CLO-1] 03

(i). Determine the rms value of the waveform.

(ii). Find the average value of the waveform.

(iii). How does the average value of the waveform compare with its RMS value?

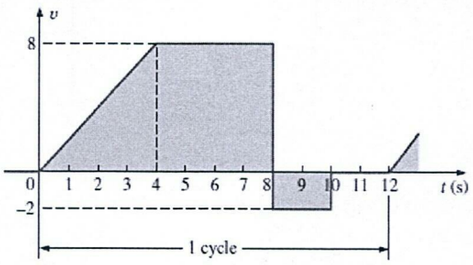



Fig. 5(d)

6(a) Define total impedance $(Z_T)$ in a series AC circuit. [L-1; CLO-2] 01

6(b) What does the power factor $(F_p)$ indicate about a series AC circuit, and what are its maximum and minimum possible values? [L-2; CLO-2] 02

6(c) Draw the impedance diagram for the circuit in Fig. 6(c) and find the total impedance. If the circuit is energized by a voltage source $E = 100\angle 0°\ V$, calculate the resulting total current *(I)* drawn from the source. Also sketch the phasor diagram of the current *(I)* and the voltage *(E)*. [L-3; CLO-2] 03

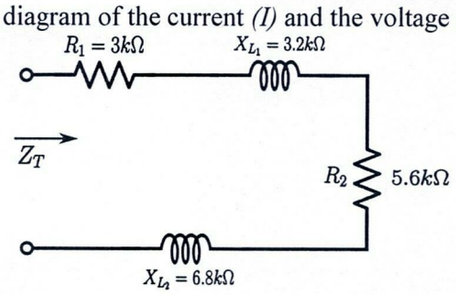



Fig. 6(c)

6(d) A series R-L-C circuit contains both inductance and capacitance. Formulate the specific condition under which the overall circuit will behave as if it were purely resistive. Discuss what happens to the total impedance and the phase angle between voltage and current under this condition. [L-5; CLO-2] 04

7(a) For the network in Fig. 7(a) [L-3; CLO-3] 03

(i). Calculate the total admittance.

(ii). Identify the total conductance and susceptance parts of total admittance.

(iii). Draw the admittance diagram.

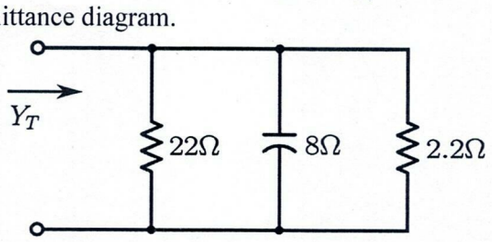



Fig. 7(a)

7(b) For the network in Fig. 7(b), [L-5; CLO-3] 05

(i). Find the values of the currents $I$, $I_R$, and $I_L$.

(ii). Draw the phasor diagram of the currents $I$, $I_R$, $I_L$ and the voltage $E$.

(iii). Verify Kirchhoff's current law at one node.

(iv). Find the average power delivered to the circuit.

(v). Find the power factor of the circuit and indicate whether it is leading or lagging.

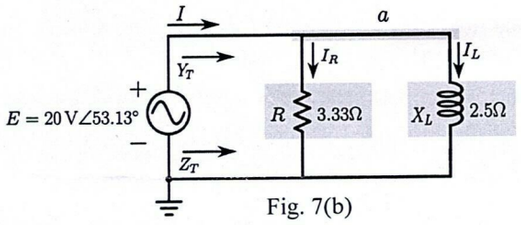



Fig. 7(b)

7(c) Calculate the currents $I_1$ and $I_2$ in Fig. 7(c) in phasor form using the current divider rule. [L-3; CLO-3] 02

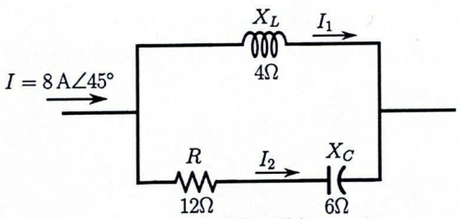



Fig. 7(c)

8(a) Define and explain Magnetomotive force and Ampere-Turn. [L-1; CLO-5] 02

8(b) In a series-parallel magnetic circuit, the total flux entering a junction divide into two parallel branches. If the total flux is $9 \times 10^{-4}\ Wb$ and Branch-1 has a reluctance of $1.5 \times 10^5 \frac{At}{Wb}$ while Branch-2 has a reluctance of $3.0 \times 10^5 \frac{At}{Wb}$, calculate the flux flowing through each individual branch. [L-3; CLO-4] 03

8(c) For the series magnetic circuit in Fig. 8(c) [L-4; CLO-4] 05

(i). Draw the magnetic circuit equivalent and the electric circuit analogy.

(ii). Find the value of $I$ required to develop a magnetic flux of $\phi = 4 \times 10^{-4}\ Wb$.

(iii). Determine $\mu$ and $\mu_r$ for the material under these conditions.

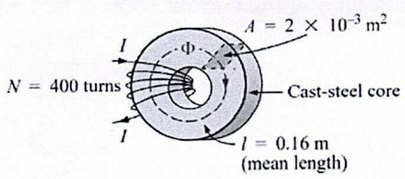
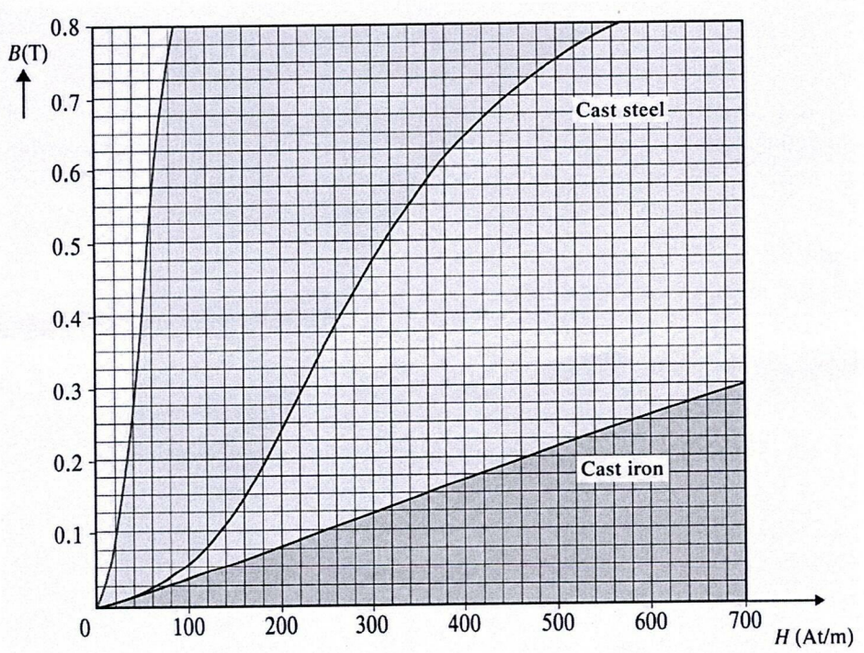



Fig. 8(c)




B-H curves for Fig. 8(c)

**Khulna University, Khulna**

Date: 26/07/2026

**First** Year, **First** Term Examination
Session: **2025-2026**
Electronics and Communication Engineering Discipline
Course No.: **0541 09 Math 1171**
Full Title of Course: **Differential and Integral Calculus**
Full Marks: **60** Time: **03** Hours Credit: **3.0**

* **The figures in the margin indicate full marks. The questions are of equal value.**
* **Use separate sheet for each section.**

## Section A

There are **Four** questions in this section. Answer any **Three** questions.

1(a) What is function? Draw the graph of the following function and find the domain and range of it. [L-1; CLO-1] 05

$$f(x) = \begin{cases} 0, & x \le -1 \\ \sqrt{1-x^2}, & -1 < x < 1 \\ x, & x \ge 1 \end{cases}$$

1(b) Define limit of a function. If $f(x) = \begin{cases} 1+x, & \text{when } x \le 0 \\ x, & \text{when } 0 < 0 \le 1 \\ 2-x, & \text{when } x \ge 1 \end{cases}$ then find $\lim_{x\to 1} f(x)$ discuss the continuity of $f(x)$ at $x = 0, 1$ [L-5; CLO-1] 05

2(a) Find $\frac{dy}{dx}$ of $(i)\ xcosy = sin(x+y)$ $(ii)\ y = x^{\tan^{-1}x} + (\sin x)^{\ln x}$ $(iii)\ y = x^{x^{x\ldots\infty}}$ [L-1; CLO-2] 05

2(b) Find the $n^{th}$ derivatives of $y = e^{2x}\sin(3x+1)$ . [L-2; CLO-3] 02

2(c) Expand $f(x) = \cos 2x$ in Taylor series in the powers of $x - \frac{\pi}{2}$ . [L-4; CLO-3] 03

3(a) State Leibnitz's theorem. If $y = (\sinh^{-1}x)^2$ then show that $(1+x^2)y_{n+2} + (2n+1)xy_{n+1} + n^2y_n = 0$ also find $(y_n)_0$. [L-2; CLO-2] 05

3(b) Find the equation of tangent and normal line to the curve $y^2 = 4x$ at $(1,2)$. Also find subtangent, subnormal along with the length of subtangent and subnormal. [L-5; CLO-3] 05

4(a) Define critical point and stationary point of a function. Find the extremum values of $x + \sin 2x,\ 0 < x < 2\pi$ [L-1; CLO-3] 04

4(b) Define radius of curvature. Find radius of curvature of the curve $y = x^2$ at $(1,1)$. [L-5; CLO-4] 03

4(c) State Euler equation for $n^{th}$ degree homogeneous equation of three variables. 03
If $u = \log_e \frac{x^3+y^3}{x^2+y^2}$ then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 1$ [L-3; CLO-4]

## Section B

There are **Four** questions in this section. Answer any **Three** questions.

5(a) Evaluate the following indefinite integrals: 04

i) $\int \frac{x^2\, tan^{-1}x^3}{1+x^6}dx$ ; ii) $\int \frac{4e^x+6e^{-x}}{9e^x-4e^{-x}}dx$ [L-5; CLO-4]

5(b) Find the antiderivative $F(x)$ of $f(x) = 2x + sinx + 2e^x$ that satisfies $F(0) = 2$. [L1; CLO-4] 03

5(c) Obtain a reduction formula for $\int sin^m x cos^n x dx$ . [L-2; CLO-4] 03

6(a) State and prove the fundamental theorem of calculus. [L-1; CLO-5] 04

6(b) Using the properties of definite integral, integrate $\int_0^{\pi} \frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}} dx$. [L-5; CLO-5] 02

6(c) Write the following series in integral form and evaluate it. [L-5; CLO-5] 04

$$\lim_{n\to\infty}\left[\frac{n}{n^2+1^2}+\frac{n}{n^2+2^2}+\frac{n}{n^2+3^2}+\cdots+\frac{n}{n^2+n^2}\right]$$

7(a) Derive the relationship between gamma and beta functions. [L-4; CLO-4] 04

7(b) Using the Beta-Gamma functions, prove that 03

$$\int_0^1 \frac{dx}{(1-x^8)^{\frac{1}{8}}} = \frac{\pi}{4\sqrt{2-\sqrt{2}}}. \quad \text{[L-5; CLO-4]}$$

7(c) Examine the convergence of the improper integral $\int_0^{\infty} \frac{dx}{x \ln x}$. [L-4; CLO-4] 03

8(a) Obtain the area enclosed by one loop of the rose $r = sin3\theta$. [L-2; CLO-5] 03

8(b) Evaluate the surface area that is generated by revolving the portion of the curve $y = x^2$ between $x = 1$ and $x = 4$, about the $y$-axis. [L-5; CLO-6] 03

8(c) Obtain the volume of the solid obtained by rotating the asteroid $x^{\frac{2}{3}} + y^{\frac{2}{3}} = 1$ around its axis of symmetry. [L-5; CLO-6] 04

**Khulna University, Khulna**

**First** Year, **First** Term Examination
Session: **2025-2026**
Date: 30/07/2026
Electronics and Communication Engineering Discipline
Course No.: **0533 09 Phy 1173**
Full Title of Course: **Physics**
Full Marks: **60** Time: **03** Hours Credit: **3.0**

* **The figures in the margin indicate full marks. The questions are of equal value.**
* **Use separate sheet for each section.**

**Section A**

There are **Four** questions in this section. Answer any **Three** questions.

1. a) Define thermal conductivity and thermal diffusivity. [L1: CLO1] 03

   b) Write down three main postulates of the kinetic theory of gases. Show that the pressure of an ideal gas is proportional to the mean square velocity of its molecules. [L2: CLO1] 04

   c) Find the value of the ideal gas constant R for one gram molecule of gas.[One gram molecule at N.T.P. occupies $22400\ cm^3\ volume$]. [L3: CLO2] 03

2. a) Define specific heat at constant pressure and at constant volume. Show that $C_p > C_v$ for an ideal gas. [L4: CLO2] 03

   b) Explain the limitations of the ideal gas law and describe how the Van der Waals equation modifies it. [L4: CLO2] 03

   c) Explain the first law of thermodynamics and derive the relation between heat, work, and internal energy. [L4: CLO2] 04

3. a) State the zeroth law of thermodynamics. What is its significance in temperature measurement? [L2: CLO2] 03

   b) Derive the efficiency equation of a Carnot engine and discuss its dependence on source and sink temperatures. [L3: CLO2] 05

   c) A carnot engine operates between a high-temperature reservoir at 500K and a low-temperature reservoir at 300K. During each cycle, the engine absorbs 600J of heat from the hot reservoir. Find the efficiency of the Carnot engine and the work done by the engine per cycle. [L3: CLO2] 02

4. a) Describe the optical and geometrical path. Establish the relation between them. [L4: CLO3] 02

   b) Mention the conditions of the interference of light. Explain Young's double-slit experiment and obtain an expression for the fringe width. [L3: CLO3] 05

   c) Distinguish between diffraction and interference with examples. [L3: CLO3] 03

## Section B

There are **Four** questions in this section. Answer any **Three** questions.

5. a) Define simple harmonic motion and discuss its characteristics. [L1: CLO3] 03

   b) Find out the total energy of a harmonic oscillator. [L1: CLO3] 04

   c) Show that for a particle executing in simple harmonic motion, the instantaneous velocity is $\omega\sqrt{(a^2 - b^2)}$ and instantaneous acceleration is $-\omega^2 y$. [L2: CLO3] 03

6. a) Why medium is essential for the propagation of a mechanical wave? [L1: CLO4] 02

   b) Deduce the differential wave equation and find its solution. [L5: CLO4] 05

   c) Explain particle velocity and wave velocity. [L2: CLO4] 03

7. a) State and explain Newton's formula for the speed of sound in gases. [L3: CLO4] 02

   b) Develop and expression for the change in frequency when, (i) Source in motion, listener and medium are rest, (ii) Source and listener both in motion and medium at rest. [L4: CLO4] 06

   c) Explain the theory of the combination of notes. [L4: CLO4] 02

8. a) Explain the analytical treatment of interference and discuss the constructive and destructive interference. [L1: CLO4] 05

   b) Discuss the analytical treatment of beats and show that the time interval between successive maxima and minima is $\frac{1}{n_1 - n_2}$. [L6: CLO4] 05