Department of Leather Engineering
Khulna University of Engineering & Technology
B.Sc. Engineering 1st Year 2nd Term Examination-2021

Ph 1219

Physics

Time: 3 Hours. Full Marks: 210

N.B. i) Answer any THREE questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.
iii) Assume reasonable data if any missing.

SECTION–A

1(a) Define the terms: point, elastic limit, elastic fatigue and sheqaringstrain. 08

1(b) Which factors affect the elasticity? 05

1(c) Let us consider a block with length 'l', width 'b', and thickness 't'. The stretches P, Q, and R are acting outwardly. Also, 'α' is known as the longitudinal strain per unit stress and 'β' be the lateral strain per unit stress. Each stress produces an extension in its own direction and a lateral contraction in the other two perpendicular directions. Now show that, $Y=3K(1-2\sigma)$, where the symbols have there usual meanings. 12

1(d) A steel wire that is 4 mm in diameter and 800 cm in length. This wire is fixed to two rigid supports. If the Young's modulus is 2×10^{11} N/m^2 and $\alpha=12\times10^{-6}$/°C then calculate the increase intension when the temperature falls by 10°C. 10

2(a) What is degrees of freedom? How many degree of freedom are needed for the monoatomic and diatomic molecules? 05

2(b) State the principle of equpartition of energy and show that energy associate with each degree of freedon is equal to $\frac{1}{2}KT$. 10

2(c) Show that the work done during an adiabatic process is depends only upon the initial temperature (T_1) and the final temperature (T_2). 10

2(d) Calculate the r.m.s velocity of the oxygen molecules at 27°C. 10

3(a) Give two statements of second law of thermodynamics and discuss reversible and irresversible processes. 12

3(b) Show that the work done in a Carnot's cycle operation is, $W=R(T_1-T_2)\ln(V_2/V_1)$, where the symbols represents their usuals menaings. 13

3(c) A Carnot engine with a heat sink operating at a lower temperature 28°C has an efficiency of 45%. What is the heat source's temperarure? How much of a temperature increase is necessary to get a 75% increase in efficiency? 10

4(a) Discuss damped S.H.M. for an electrical circuit and show the conditions under which the discharge of the capacitor is dead beat, critically damped and oscillatory. 15

4(b) Draw the following planes and directions: $(1\bar{1}1)$, $(\bar{1}01)$, (011), [012], [010] (for cubic crystal. 10

4(c) Find the packing fraction for BCC and FCC structures. 10

SECTION–B

5(a) Two independent sources of the light cannot procdcue perfect dark fringes. Is it true? Give logic in favour of your statement. Show the interference phenomena by drawing spherical waves. 08

5(b) Show that the distance between any two consecutive bright or dark fringes is equal to the width of a fringe. 10

5(c) For double slit diffraction pattern show that the angular separation between any two consecutive minima (or maxima) is equal to $\frac{\lambda}{a+b}$. 07

5(d) Newton's rings are observed in reflected light of wavelength 5890 Å. The diameter of the 10^{th} dark ring is 0.50 cm. Find the radious of curvature of the lens and the thickness of the air film. 10

6(a) What is necessity of quantum theory to explain photoelectric effect? What are the basic differences between photoelectric effect and compton effect? 10

6(b) Give the explanation of Compton effect with the help of quantum theory and find an expression for the compton shift $\Delta\lambda$. At what condition maximum wavelength shift happens? 15

6(c) The work function of a tungsten surface is 5.4 eV. When the surface is illuminated by light of wavelength 175 nm, the maximum photoelectron energy is 1.7 eV. Find Planck's constant from these data. 10

7(a) An electron is not the part of a nucleus. Is it true? Give logic in favour of your statement. Explain the origin of characterisctic X-rays. 10

7(b) Explain the terms: Absorption, stimulated emission, spontaneous emission and population inversion. Give the construction and working principle of Ruby LASER. 15

7(c) The phase velocity of ocean wave is $\sqrt{\frac{g\lambda}{2\pi}}$, where g is the acceleration due to gravity. Find the group velocity of ocean wave. 10

8(a) In the case of successive radioactive disintegration, show that at any instant of time the number of atoms present in the second element is given by $N_2 = \left(\frac{\lambda_1 N_0}{\lambda_2 - \lambda_1}\right)\left[e^{-\lambda_1 t} - e^{-\lambda_2 t}\right]$ 13

8(b) What is radioactivity? Describe some practical aplications of radioactivity. 12

8(c) The half life of radon is 3.8 davs. After what time will a sampe of radon become $\frac{1}{e}$ of its original value? 10

Department of Leather Engineering
Khulna University of Engineering & Technology
B. Sc. Engineering 1st Year 2nd Year Examination-2021
Ch 1219
Organic Chemistry

Time: 3.0 Hours | Full Marks: 210

N.B. i) Answer any **THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.
iii) Assume reasonable data if any missing.

SECTION–A

1(a) Define i) Electronegativity, ii) Polar covalent bonds, and iii) Molecular orbitals. Calculate the electronegativity of carbon from the following: 12
$E_{H\text{-}H}$ = 104.2 Kcal/moL, $E_{C\text{-}C}$ = 83.1 Kcal/moL
$E_{C\text{-}H}$ = 98.8 Kcal/moL, X_H = 2.1;
E is the bond energy between the atoms; X is the electronegativity of the element.

1(b) What is dipole moment? What is the unit of dipole moment? Although molecules of CO_2 have polar bonds, CO_2 has no net dipole moment. What can you conclude about the geometry of a CO_2 molecule? 10

1(c) H-O-H bond angle in a water molecule is 104.5^0. What does this value suggest about the hybridization state of the oxygen atom in water? 05

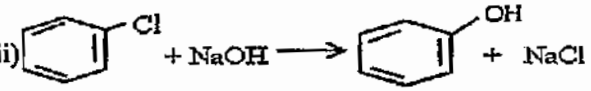
1(d) Using VSEPR theory, predict the geometry of the following molecules: 08
(i) CO_2, (ii) NH_3, (iii) CH_4, (iv) BF_3 and (v) BeH_2

2(a) Define carbocation. Why 3^0 carbocation is more stable than 1^0 carbocation? 10

2(b) How does the presence of peroxides favor anti-Markonikov addition of HBr to unsymmetrical alkenes? 10

2(c) Identify the neucleophile, substrate, and leaving groups of the following reactions: 08

(i) $CH_3-CH_2-Br+KN_3 \rightarrow CH_3-CH_2-N_3+KBr$

(ii) 

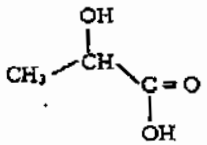
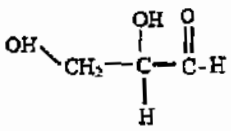
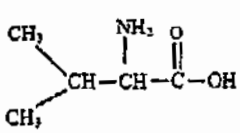
2(d) Name the following reactions: 07

(i) $OH^- + CH_3-CH_2-Br \rightarrow CH_3-CH_2-OH+Br^-$

(ii) $CH_2=CH-CH=CH_2+CH_2=CH_2 \rightarrow$ 

(iii) $CH_2=CH_2+HBr \rightarrow CH_3-CH_2-Br$

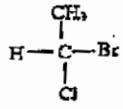
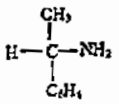
3(a) Define the following terms: (i) Stereoisomer (ii) Enantiomer (iii) Diastereomer. 12
Which atoms in each of the following molecules are chirality centers?

(i)  (ii)  (iii) 

3(b) List the substituents in each of the following sets in order of priority from highest to lowest: 07
(i) - Cl , - OH, -SH, -H (ii) – CH_3, $-CH_2Br$, - CH_2Cl, $-CH_2OH$

3(c) What do you mean by enantiomeric excess? A mixture of the 2-butanol enantiomers showed a specific rotation of +6.76. Specific rotation of the pure enantiomer is +13.52. Determine enantiomeric excess of the solution. 08

3(d) Using the symbols R and S, Specify the configuration of each of the following: 08

(i)  (ii) 

4(a) "Halogenation of benzene is electrophilic substitution reaction whereas halogenation of alkene is electrophilic addition reaction" Justify the statement. 12

4(b) Explain why racemic mixtures are obtained during S_N^1 reaction if the substrate has an electrophilic chiral center? 10

4(c) Write the possible isomers of the following chemical formulas: 08
(i) C_2H_5O (ii) C_4H_{10} (iii) C_3H_7Cl (iv) $C_2H_2Cl_2$

4(d) Mention what type of hybridization is present at the carbon of the following compounds: 05

(i) H – C – H (ii) CH ≡ CH (iii) H_2C=CHCl (iv) CCl_4

SECTION–B

5(a) Why is Gabriel synthesis preferred for synthesizing primary amine? Synthesize primary amine by this method. 12

5(b) How will you separate amine from non-basic water insoluble compounds? 10

5(c) Compare the basicity of 3^0 and 2^0 amine in aqueous media. 08

5(d) "Quaternary amine is not basic" Why? 05

6(a) What is diazotization reaction? Prepare chlorobenzene, phenol and benzene from diazonium salt. 10

6(b) What is azo compound? How will you identify 1^0, 2^0 and 3^0 amine? 09

6(c) What are the evidence of cyclic structure of glucose? 10

6(d) Draw the Haworth Projection and chair conformation of D-Galactose. 06

7(a) What do you mean by mutarotation? In neutral or basic solutions, glycosides do not show mutarotation. However, in acidic solutions, glycosides show mutarotation. Explain this behavior. 10

7(b) What are the differences between starch and glycogen structurally? 10

7(c) Complete the following reactions: 10

(i) $A + (CH_3CO)_2O \xrightarrow{\text{Pyridine}}$

(ii) $A + CH_3I \xrightarrow{Ag_2O}$

(iii) $A + CH_3CH_2OH \xrightarrow{HCl}$

A is anomer of α-D-glucose

7(d) Synthesize D- Mannitol from D-Mannose. 05

8(a) What is Meisenheimer intermediate? Discuss the mechanism of $S_N A_r$ reaction. 11

8(b) "Phenol is acidic in nature whereas alcohol is neutral"–Explain the term. 09

8(c) How will you prepare cresol and azobenzene form benzene? 08

8(d) Draw the orbital picture of nitro group with explanation. 07

Department of Leather Engineering

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B.Sc. Engineering 1st Year 2nd Term Examination-2021

Math 1219

Mathematics II

Time: 3 Hours. Full Marks: 210

N.B. i) Answer any THREE questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.
iii) Assume reasonable data if any missing.

SECTION–A

1(a) Reduce the equation $x^2 + 2xy + y^2 - 6x - 2y + 4 = 0$ to the standard form and identify the conic. 18

1(b) Identify the conic $x^2 - 5xy + y^2 + 8x - 20y + 15 = 0$ by short method. Check that the above conic is central or not. If central, then find the center of the conic. If possible, remove the first degree terms from the above equation. 17

2(a) Find the cylindrical and spherical polar co-ordinate of the point (4, -2, -1). 10

2(b) If direction cosines of two lines are connected by the relations $l - 5m + 3n = 0$ and $7l^2 + 5m^2 - 3n^2 = 0$, then find the angle between the lines. 12

2(c) A right circular cone is passing through the point (1, 1, 1) and its vertex is the point (1, 0, 1). The axis of the cone is equally inclined to co-ordinate axes. Find the equation of the cone. 13

3(a) Find the equation of the plane which passes through (x_1, y_1, z_1) and perpendicular to the planes $a_1x + b_1y + c_1z + d_1 = 0$ and $a_2x + b_2y + c_2z + d_2 = 0$. 10

3(b) Examine that the four points (3, 3, 0), (2, 1, -1), (1, 1, 1) and (0, -1, 0) are coplanar or not. If coplanar then find the equation of the plane containing them. 10

3(c) Find the length of the shortest distance between the lines $\frac{x}{4} = \frac{y+1}{3} = \frac{z-2}{2}$ and $5x - 2y - 3z + 6 = 0 = x - 3y + 2z - 3$. 15

4(a) Find the distance of the point (3, 2, -1) from the plane $2x + 3y - 4z = 9$ measured parallel to the line $x - 4y + 2z + 6 = 0 = 3x + y - 4z$. 12

4(b) Find the center and nature of the surface 11
$3x^2 + 7y^2 + 3z^2 + 10yz - 2zx + 10xy + 4x - 12y - 4z + 1 = 0$.

4(c) Find the equation of the sphere which touches the plane $3x + 2y - z + 2 = 0$ at the point (1, -2, 1) and cuts orthogonally the sphere $x^2 + y^2 + z^2 - 4x + 6y + 4 = 0$. 12

SECTION–B

5(a) Find the differential equation of $y = Ax^2 + Be^x + Ce^{-2x}$, where A, B, and C are arbitrary constants. 12

5(b) Define initial value problem and boundary value problem with examples. Solve $x \sin y\, dx + (x^2+1)\cos y\, dy = 0;\ y(1) = \pi/2.$ 13

5(c) Define partial differential equation. Form a partial differential equation by eliminating the arbitrary function φ from $\varphi(x^2+y^2+z^2,\ z^2 - 2xy) = 0.$ 10

6(a) Define integrating factor. Find the integrating factor of the differential equations 11

(i) $y(2xy+1)\,dx + x(1+2xy-x^3y^3)\,dy = 0$ (ii) $\left(y + \frac{1}{3}y^3 + \frac{1}{2}x^2\right)dx + \frac{1}{4}(x + xy^2)\,dy = 0$

Write the non-homogenous linear differential equation of order n with constant co-efficient.

6(b) Hence solve $(D_2 + 4)\,y = x^2 \sin 2x.$ 12

6(c) Find the general solution of $D^2y - 3Dy + 4y = \cos(4x+5).$ 12

7(a) Define Legendre's Linear equation. Solve the problem 13

$$(x+1)^2 \frac{d^2y}{dx^2} + (x+1)\frac{dy}{dx} = (2x+3)(2x+4).$$

7(b) Solve $(D^2+2)y = x^2e^{3x} + e^x \cos 2x$ 10

7(c) Define explicit and implicit solution. Examine the nature of the solution of the following differential equation $x^2y'' + 4xy' + 2y = 0 \qquad y(1) = 1, \qquad y'(1) = 2.$ 12

8(a) Define degree and order of partial differential equation. Find degree, order and linearity of the following differential equations, if non-linear then explain then explain the reasons. 15

(i) $\left(\frac{\partial z}{\partial x}\right)^2 + \frac{\partial^3 z}{\partial x^3} = 2x\frac{\partial z}{\partial y}$ (ii) $\frac{\partial^2 z}{\partial x^2} = \left(1 + \frac{\partial z}{\partial y}\right)^{1/2}$

(iii) $\frac{d^2y}{dx^2} + 2\left(\frac{dy}{dx}\right)^2 + y = e^x$ (iv) $\sqrt[3]{\frac{d^3y}{dx^3} - y} = \sqrt[5]{\left(\frac{dy}{dx}\right)^3 + y^2}$

8(b) Solve $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$ subject to the coordinates $u(0, t) = u(3, t) = 0$ and $u(x, 0) = x.$ 20

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B. Sc. Engineering 1st Year 2nd Year Examination-2021

CSE 1219

Computer Fundamentals and Programming

Time: 3.0 Hours | Full Marks: 210

N.B. i) Answer any **THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.
iii) Assume reasonable data if any missing.

SECTION–A

1(a)	Draw a block diagram to illustrate the basic functional units of a computer and explain the functions of each unit.	11
1(b)	Why is a computer known as a data processor? Mention the difference between data and information.	12
1(c)	What kind of device is a keyboard? How many types of keyboards are available for use in computer?	12
2(a)	What do you mean by "word length" of a computer? Which type of word length is preferable?	08
2(b)	Distinguish among RAM, ROM, and auxiliary memory.	08
2(c)	Explain the access mechanism of the optical disk.	08
2(d)	Explain (i) Cache memory (ii) Winchester disk (iii) CD-ROM jukebox (iv) Register	11
3(a)	What is flowchart? How does a flowchart help a programmer in program development?	08
3(b)	Write an algorithm to calculate if the year 1900 is a leap year or not. Also, draw the corresponding flowchart.	18
3(c)	Design a combinational circuit of a half-adder with NAND gate only.	09
4(a)	Suppose a computer uses ASCII for its internal representation of characters. In which order will this computer sort the strings A1, 1A, b3, 2a, aB, Ba, and 34?	04
4(b)	Write binary coding for the word "LEATHER" in EBCDIC. How many bytes are required for this representation?	15
4(c)	Perform the following subtraction by 2's complement method: (i) 19-9 (ii) -5+11	08
4(d)	Divide $(35)_8$ by $(17)_8$	08

SECTION–B

5(a) What is the basic difference between keyword and identifier? Find identifiers and keywords from the following program: 13

```
#include<Stdio.h>
Void   MAX (int Val1, int Val2)
{
        if (Val1 > Val2)
        {
            printf ("%d", Val1);
        }
        else
        {
            printf ("%d", Val2);
        }
}
int     main ( )
{
        int a, b;
        Scanf ("%d    %d", &a , &b);
        MAX (a,b);
        return  0;
}
```

5(b) What are the various data types in C? Determine appropriate data types for the following variables and explain the reasons behind your selection. 12

(i) Average marks of 60 students.

(ii) Name of a student.

(iii) Distance from Dhaka to Khulna.

(iv) Address of KUET.

(v) Postcode of KUET.

5(c) Compare and contrast global and local scope of a variable. 10

6(a) What is the basic structure of a C program? Explain with proper diagram. 10

6(b) What are the rules for the identifiers in C program? Explain with appropriate example. 10

6(c) Write a program to copy the components of one file to another. 05

6(d) What is the value of a, b, c, d, and e after executing the following statements line by line? 10

```
int a = 20, b= 10, e = 19;
int c = ++ a – b;
int d = b++  + e;
Printf (" a= %d , b = %d , c = %d , d= %d , e = %d", a,b,c,d,e);
```

7(a) What are the control structures in C language? Explain switch case with appropriate example. 15

7(b) Write a C program that takes marks of a course from the user and prints the corresponding grade base on the following table: 12

Mark Range	Grade
>= 90	A^+
>= 75 and < 90	A
>= 60 and < 75	B
< 60	F

7(c) "An array is one type of pointer"- Justify the statement with a suitable example. 08

8(a) Which loop will guaranty that it will execute at least one time? Provide syntax, flow diagram and an example of this loop. 12

8(b) What is meant by call by value and call by reference in parameter passing in a function? Write a function in C program to calculate the sum of the three integer number. 15

8(c) Describe basic file operations with appropriate syntax and example. 08