KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 1st year 2nd Term Examination, 2018
Department of Computer Science and Engineering
CHEM 1207
Chemistry

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.

SECTION A
(Answer **ANY THREE** questions from this section in Script A)

1. a) Define unit cell and crystal lattice. Discuss various elements of symmetry of a cubic crystal (09)
   lattice.
   b) Write down the differences between molecular crystals and ionic crystals.   (08)
   c) Illustrate the stoichiometric defects.   (10)
   d) What is miller indices? Calculate miller indices of a crystal plane which is cut through the (08)
   crystal axes 2a, 3b, and 2c.

2. a) What are the important postulates of VBT? Give the limitations of VBT.   (09)
   b) "N_2 molecule possesses triple bonds and diamagnetic in nature" – explain the statement with (12)
   the help of molecular orbital theory.
   c) Write down the similarities and dissimilarities between BVT and MOT.   (10)
   d) What is resonance? Write down the resonance structure of CO_2.   (04)

3. a) Explain about electrochemical equivalence, ionic mobility and 3 Faradays.   (09)
   b) Briefly discuss the Debye-Huckel theory of activity coefficients of strong electrolytes.   (10)
   c) What is electroplating? How can it be done?   (10)
   d) 0.5 Normal solution of a salt placed between two platinum electrodes, 20 cm apart and area of (06)
   cross-section 4.0 sq. cm has a resistance of 25 ohms. Calculate the equivalent conductance of
   the solution.

4. a) Draw and explain an electrolytic cell and Galvanic cell. Write down the sign convention and   (10)
   types of reaction of these cells.
   b) Discuss the principle of determination of p^H of a solution with the help of a standard Hydrogen (08)
   electrode.
   c) What is Li-ion battery? Draw two-dimensional picture of Li-ion battery. Write down the   (10)
   reaction of this battery at anode and cathode.
   d) What is salt-bridge? How is it used? Explain its working principle giving an example.   (07)

SECTION B
(Answer **ANY THREE** questions from this section in Script B)

5. a) Write down the mechanistic steps with chemical equation of the reaction when H_2 and Br_2 (05)
   react in presence of light.
   b) Explain the terms. (i) Photosensitizations (ii) Quenching and (iii) Quantum yield.   (09)
   c) Write down the conditions for the reaction of (i), $\phi > 1$ (ii) $\phi < 1$ and (iii) $\phi = 1$; Hence $\phi =$ (13)
   quantum yield.
   d) What do you mean by Einstein? Calculate the value of Einstein for the radiation of wavelength (08)
   $5000 \overset{0}{A}$.

6. a) What is photon? Calculate the energy in joule of a photon from sodium D line at 590 nm.   (09)
   b) What is black body? Write down the characteristic properties of black body radiation.   (09)
   c) Explain about emission and absorption spectra.   (08)
   d) Write down the postulates of Bohr's atom model based on quantum theory.   (09)

7. a) Write down the differences between thermoplastic polymer and thermosetting polymers.   (08)
   b) Explain cationic and anionic polymerization processes with suitable examples.   (12)
   c) What is conducting polymer? Write down the preparation method of polyamine   (11)
   d) What is condensation polymerization? Give one example   (04)

8. a) "An electromagnetic radiation contain both particle and wave property"-explain.   (08)
   b) Explain briefly fluorescence and phosphorescence   (10)
   c) What is photoelectric effect? Describe with help of Einestein experimental set up.   (09)
   d) Describe the basic instrumentation of a spectrophotometer.   (08)

TIME: 3 hours   FULL MARKS: 210

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SECTION A
(Answer **ANY THREE** questions from this section in Script A)

1. a) Why C is called a structured Programming Language? (08)
    b) Suppose if you want to learn English natural Language, you have to first learn alphabet, then (07) words, sentences and finally paragraph. Now, if you want to learn a computer Language C, then what will be the steps?
    c) Discuss different types of C programming Languages instruction in details. (12)
    d) How does malloc() and calloc() function work? Why do you use these functions? (08)

2. a) What is associativity of operators? Explain with proper example. (07)
    b) If $i = 4, j = -1, k = 0$; determine the values of the following expression. (10)

    $i) i + 5$ && $j + 1 \| k + 2$;

    $ii) i + (5$ && $j) + (1 \| k) + 2$;

    $iii) 3$ && $i != 8 \| !k$;

    $iv) i - 43 ? k + 2 : j$;

    $v) i + 5$ & $j + 1 | k + 2$;

    c) Show the Implicit type conversion and explicit type conversion with example. (08)
    d) Differentiate between logical and bitwise operators with examples (10)

3. a) Any character is entered through the keyboard, write a program to determine whether the (10) character entered is a capital letter, a small letter, a digit or a special symbol.
    Hints: Use ASCII value and else if ladder.
    b) When do you decide to use switch case and else if ladder? (10)
    c) Draw the working flowchart of while loop. (07)
    d) What will be the output of the following Program? (08)

```c
#include < stdio.h >
int main(){
int i;
for(i = 0; i < 10; i++,++i){
    print f("J = %d \n",--i);
}
return 0;
}
```

4. a) Why stack overflow error occurs in recursion? Discuss with example. (10)
    b) What is variadic function? Show some examples of variadic function in C programming (07) Language.
    c) What is meant by call by value and call by reference in parameter passing in function? Briefly (08) discuss with appropriate example.
    d) Implement a function "Summation "that will take N values as parameter(s) and return the (10) summation. the data type of the N values will follow the following pattern: int, double, int, double, int, double for N = 6

(Answer **ANY THREE** questions from this section in Script B)

5. a) Write a program in C that randomly fills in 0s and 1s into a Tic Tac Toe board, print the (10) board, and find out the rows, columns or diagonal with all 0s or 1s. Use two dimensional array to present a Tic Tac Toe board. Here is a sample of the program.

Tic Tac Toe Board

0 0 0

0 0 1

1 1 1

All 0s on row 0

All 1s on row 2

b) What is the output of the following program? Assume the program is error free and well (10) compiled.

```
#include <stdio.h>
int f(int a,int* b);
int main()
{
int a = 3,b = 7,c = 4;
c = f(b,&a)+3;
printf("a = %d,b = %d,c = %d \n",a,b,c);
b = f(a,&c);
printf("a = %d,b = %d,c = %d \n",a,b,c);
return 0;
}
int f(int a,int* b){
*b = (a+3)*2+(*b)%4;
a = *b - a%6;
printf("a = %d,b = %d \n",a,*b);
return 2*a-(*b);
}
```

c) Explain the difference between 'x' and "x" when used as constants in C. (07)

d) How can you initialized a structured variable? Give example. (08)

6. a) Compare and contrast the sturct and union keywords in C. supplying an example of a (07) situation where it would be more appropriate to use a union rather than a sturct.

b) Write down the macro definitions for the following: (08)
    i)   To find arithmetic mean of two numbers.
    ii)   To convert an uppercase alphabet to lowercase.

c) How many ways to define a structure variable? There is a structure called employee that (12) holds information like employee code, name, date of joining. Write a program to create an array of structures and enter some data into it then ask the user to enter current date. Display the names of those employees whose tenure is 3 or more than 3 years according to the given current date.

d) How can we pass a structure pointer to a user defined function? Briefly describe with suitable (08) example.

7. a) Is it necessary that a file created in text mode must always be opened in Text mode for (06) subsequent operations?

b) Write a program to copy one file to another. While doing so replace all lowercase characters (10) to their equivalent uppercase characters.

c) How much memory allocated by the following two structures with similar properties. In a 32- (12) bit processor. How can we force to allocate exact memory space that is needed for these structure definition? Explain briefly with appropriate figures and coding.

struct *stuture* 1	struct *stuture* 2
{	{
int *id*1;	int *id*1;
int *id*2;	char *name*;
char *name*;	int *id*2;
char *c*:	char *c*:
float *percentage*;	float *percentage*;
};	};

d) Is it possible to return multiple values from a function? Explain your answer with suitable (07) example.

8. a) What will be the output of the following program? (It does compile and execute without (10) errors)

```
#include < stdio.h >
void main(){
int i = 32, j = 65, k, l, m, n, o, p;
k = i | 35;
i = ~ k;
m = i & j;
n = j^32
o = j << 2;
p = i >> 5;
print f("\n k = %d, i = %d, m = %d", k, l, m);
print f("\n n = %d, o = %d, p = %d", n, o, p);
}
```

b) What are the advantages of fread() and fwrite() function over fscanf() and fprintf()? Show an (07) appropriate example.

c) What impact does the keyword static have on the variable? The following program contains a (12) programming errors (not necessarily a syntax error). State clearly what the errors are. Provide line number when specifying the error and also suggest a solution of that particular error.

```
/*1*/   #include < stdlib.h > .
/*2*/   #include < stdio.h >
/*3*/   int* findMax(int* a, int* b){
/*4*/   int max;
/*5*/   if(*a > *b)  max = *a;
/*6*/   else  max = *b;
/*7*/   return  & max;
/*8*/   }
/*9*/   int main(){
/*10*/  int x = 7, y = 15, max;
/*11*/  max = findMax(&x, &y);
/*12*/  return 0;
/*13*/  }
```

d) What is meant by these following pointer declarations? (06)

  i)   int * *p*(int *a*)

  ii) int (**p*)(int *a*)

  iii) int *(**p*)(int(*a*)[])

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 1st Year 2nd Term Examination, 2018
Department of Computer Science and Engineering
CSE 1203
Digital Logic Design

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.

SECTION A
(Answer **ANY THREE** questions from this section in Script A)

1. a) State duality principle. Show that the dual of the exclusive-OR is equal to its complement. (07)
   b) Express the following function in a sum of minterms and product of maxterms. (10)

   distinct $F(w, x, y, z) = y'z + wxy' + wxz' + w'x'z$

   c) How many ~~distriet~~ distinct Boolean functions are there of n Boolean variables? (04)
   d) Is it possible to replace a 4 input NOR gate with 2 input NOR gates? Justify your answer. (05)
   e) A majority gate is a digital circuit whose output is equal to 1 if the majority of the inputs are (09)
      1's. The output is 0 otherwise. By means of a truth table, find the Boolean function,
      implemented by a 3-input majority gate. Simplify the function.

2. a) Define Odd function, Even function, Don't –care conditions. (06)
   b) The following Boolean expression: $BE + B'DE'$ is a simplified version of the expression: (10)
      $A'BE + BCDE + BC'D'E + A'B'DE' + B'C'DE'$. Are there any don't-care conditions? If so,
      what are they?
   c) If the function $F(w, x, y, z)$ is equal to $\sum(1, 4, 6, 7, 8, 9, 10, 11, 15)$ and the prime implicants (07)
      are $x'y'z, w'xz', w'xy, xyz, wyz, wx'$ then show how the prime implicants are selected to
      return simplified function.
   d) Design a four-bit binary adder using 1-bit full adder circuit. How can it be modified to use as (12)
      a four bit subtractor?

3. a) Obtain the equivalent AND-OR logic diagram of the following figure. (06)
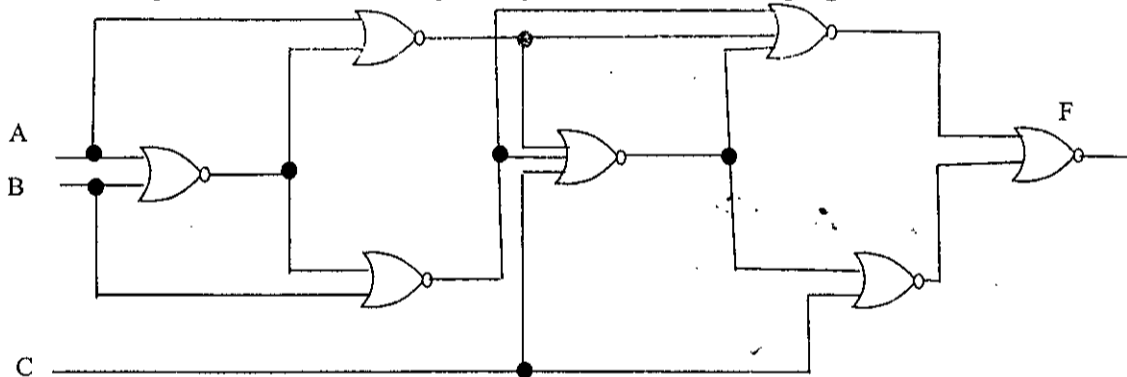
   b) Design a combinational circuit that accepts a 4-bit number and generates a 3-bit binary (12)
      number output that approximates the square root of the number.
   c) Write down the output Boolean functions and truth table for the following circuit: (12)
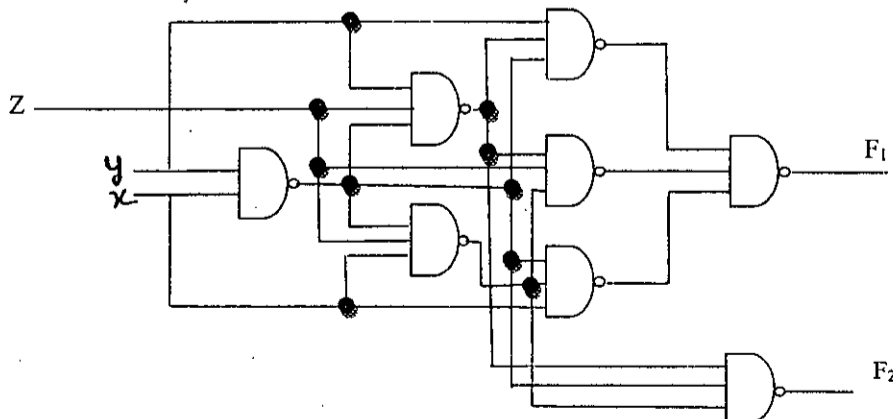
   d) **Prove or disprove that NAND operator is not associative over NOR operator.** (05)

4. a) Suppose, you need a full adder for an experiment. But in lab, you could not find a full adder, (10)
      instead you found plenty of 3-to-8 decoders. Can such decoder be used as a full adder?
      Explain your answer with truth table.
   b) How many don't-care inputs are there in a BCD adder? (05)

c) Design a combinational circuit with 3 inputs: x, y, and z, and 3 outputs: A, B, and C. When (11) the binary input is 0, 1, 2, or 3, the binary output is two greater than the input. When the binary input is 4, 5, 6, or 7, the binary output is three less than the input.

d) What is a multiplexer circuit? Implement the following function with a multiplexer. (09)
$F(A,B,C,D) = \sum(1,7,9,11,15)$. Use A, B, and D as selector inputs.

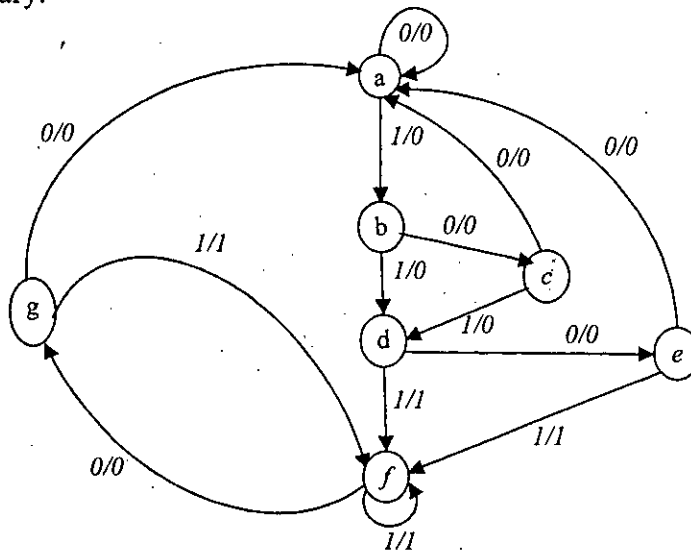5. a) Write the differences between combinational circuit and sequential circuit. (06)

b) Given a sum of minterms- (10)
$$F_1(A_2A_1A_0) = \sum(1,4,7), \quad F_2(A_2A_1A_0) = \sum(0,3,5,7), \quad F_3(A_2A_1A_0) = \sum 2,5,7$$
Design a ROM with as minimum Lines as possible.

c) Design a PLA which considers 3-bit input line generating excess-3 value as the output. (13)

d) Convert a T flip-flop into a JK flip-flip-flop and vice versa. (06)

6. a) What are the differences between latch and flip-flop? (05)

b) Write down the truth table, characteristic table and excitation table of SR flip-flop and also (11) draw the figure of SR flip-flop.

c) How a race around condition occurs in JK flip-flop. Explain it using truth table and timing (11) diagram.

d) Design a SR Flip-Flop using a D Flip-Flop and a 4×1 MUX. (08)

7. a) Prove that master – slave flip-flop is equivalent to negative edge triggered flip-flop. (12)

b) Convert SR flip-flop to JK flop-flop using flip-flop conversion method. (13)

c) Design a sequential circuit for the following state diagram. Assume the edges are inputs and (10) outputs will be resulted from flip-flops you will use.
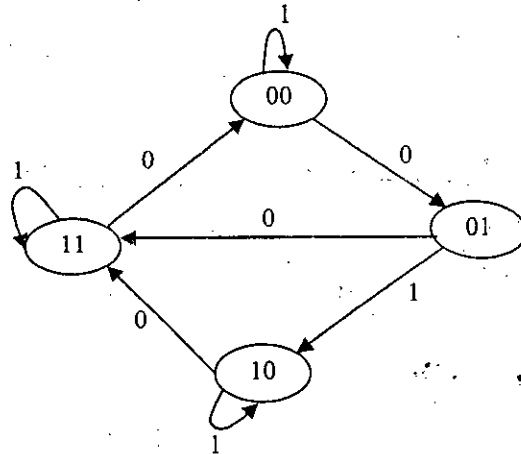
8. a) Define register and its classification (05)

b) Design a sequential circuit for the following state diagram. Use state assignment and (15) reduction if necessary.

c) Design a 3-bit Synchronous and Asynchronous up counter. Necessary figures and tables (15) should be written.

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 1st Year 2nd Term Examination, 2018
Department of Computer Science and Engineering
EEE 1217
Analog Electronic Circuits

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.

SECTION A
(Answer **ANY THREE** questions from this section in Script A)

1. a) What is doping of semiconductor? Explain the formation of depletion layer in a p-n junction. (12)
   Also explain a p-n junction on deferent biasing conditions.

   b) "A semiconductor diode can act as a switch" – Justify the statement. Write down the effects (09)
   of temperature on semiconductor diode.

   c)   (07)
   Determine the dc voltage available
   for the network as shown in the
   figure.
   Also sketch the wave shape for V_0.
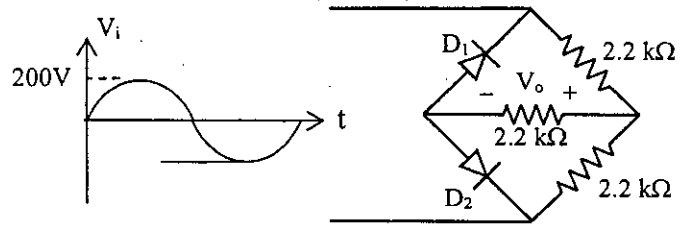
   d) Draw the necessary circuits and diagrams to make a comparison between a rectifier and a (07)
   zener diode.

2. a) "A zener diode can act as a voltage stabilizer" – Justify your answer with necessary diagrams. (08)
   b) Calculate the efficiency, ripple factor and peak inverse voltage for a full wave rectifier and (12)
   compare with half wave rectifier.

   c) For the circuit as shown in the figure,   (07)
   Find the maximum and minimum values of
   zener diode current.
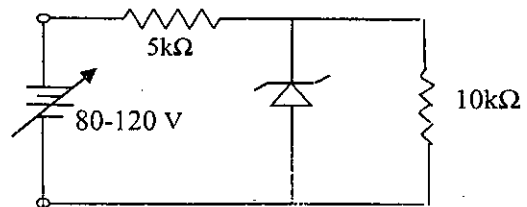
   d) What is operating point and faithful amplification of a transistor? Why they are essential? (08)
   Mention the conditions for faithful amplification.

3. a) Define stabilization of a transistor. Why this is needed? Write down the significance of (10)
   stability factor.

   b) Derive the following expression- $s = \dfrac{\beta+1}{1-\beta\left(\dfrac{dI_B}{dI_C}\right)}$ Where the symbols have their usual (11)

   meanings. How better stabilization can be obtained for voltage divider bias rather than base
   resistor bias? Explain Mathematically.

   c) Explain the operation of Darlington pair circuit and analyze how we can get $\beta = \sqrt{\beta_1 \times \beta_2}$. (07)

   d) Calculate the value of emitter current   (07)
   of the right side network figure:
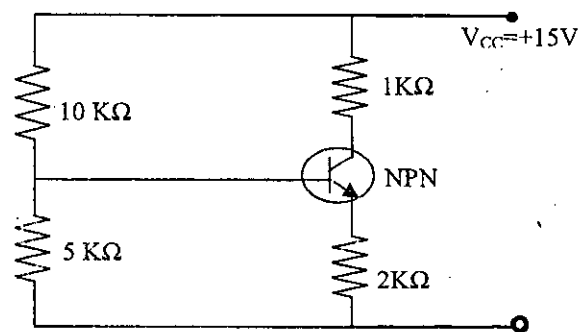
4. a) Why JFET is called a voltage control device? Describe the construction and working (15)
   principle of n-channel JFET.

   b) Design an CMOS circuit which act as a logic inverter. Write down the major difference (12)
   between depletion type MOSFET and enhancement type MOSFET.

c) A JFET in figure has values of $V_{GS(off)} = -8v$ and $I_{DSS} = 16mA$. Determine the values of V_{GS}, I_D and V_{DS} for the circuit, also find operating point. (08)
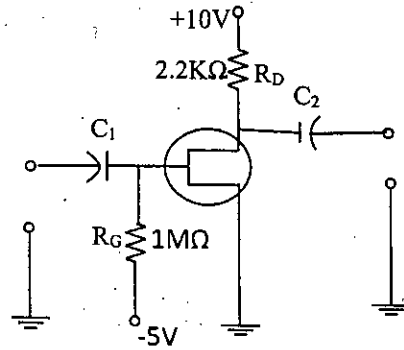

SECTION B
(Answer **ANY THREE** questions from this section in Script B)

5. a) Explain UJT as relaxation oscillator and derive the expression for the frequency of generated saw-tooth wave from the oscillator. (09)

b) Draw the two transistor model of SCR and explain the characteristics curve indicating all significant points. (08)

c) With neat sketch, explain the working principle of SCR as half wave rectifier. Also derive the expression of average output voltage and current. (09)

d) An SCR half –wave rectifier has a forward breakdown voltage of 150V when a gate current of 1 mA flows in the gate current. If a sinusoidal voltage of 400Vpeak is applied, find: (i) firing angle, (ii) average output voltage, (iii) average current for a load resistance of 200Ω (iv) Power output. Assume that the gate current is 1mA through-out and the forward breakdown voltage is more than 400V when I_g = 1mM. (09)

6. a) Why is dc power supply needed in our daily life? Explain standby or off-line UPS, line-interactive UPS and online UPS with necessary diagrams. (12)

b) How we can differentiate between passive filter and active filter? Design and explain of an active band pass filter, also show frequency response of it. (09)

c) Draw the schematic diagram of a dc power supply using a full-wave bridge rectifier, RC filter, and IC regulator to provide an output of +5V. (06)

d) Design an UJT relaxation oscillator circuit. An UJT has 12V between the bases. If the intrinsic stand-off ratio is 2/3, find the value of stand-off voltage. What will be the peak point voltage if the forward drop in the p-n junction is 0.7V? (08)

7. a) Deign an op-amp circuit which act as a differentiator and integrator and mathematically analyze how it works as a differentiator and integrator use necessary diagrams for mathematically analysis. (10)

b) Draw the op-amp inverting amplifier and non-inverting amplifier circuits also draw their corresponding ac equivalent circuits. (08)

c) Explain on CMRR and slew rate. Also examine their practical significances. (08)

d) Calculate the output voltage of the circuits: (09)

7(d)(i)

7(d)(ii)
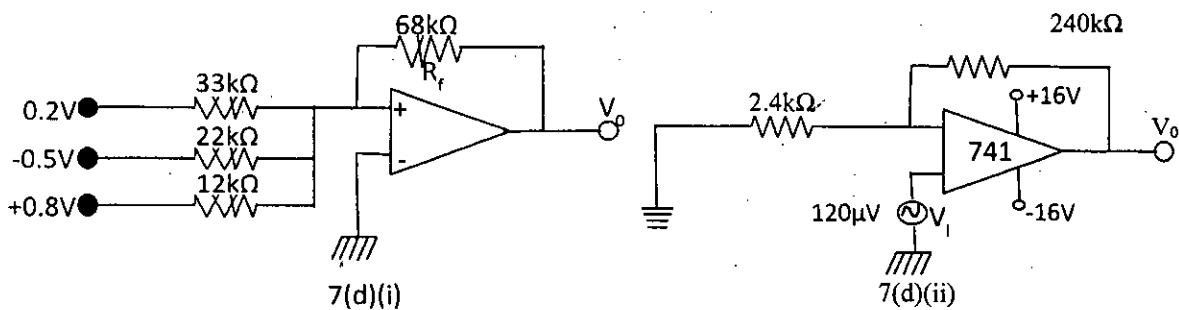
8. a) Define electronic oscillator. What are the essential parts of an oscillator? "LC circuit produces damped oscillation"-Justify this. (11)

b) Mention the differences of an alternator and oscillator? Draw the block diagram of UPS and explain in brief. (08)

c) Calculate the cut-off frequency of a second order high pass filter for the figure: Where $R_1 = R_2 = 2.1k\Omega, c_1 = c_2 = 0.05\mu F$, $R_G = 10K\Omega \, and \, R_F = 50K\Omega$ (08)
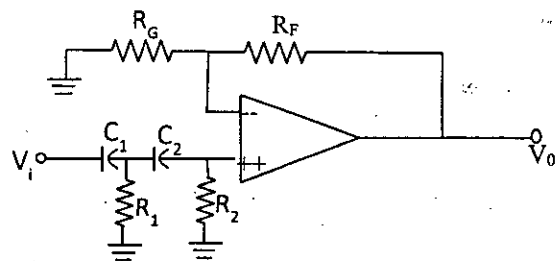
d) How undamned oscillation can be obtained? Explain the principle of operation of a Hartley Oscillator. (08)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 1st Year 2nd Term Examination, 2018
Department of Computer Science and Engineering
MATH 1207
Coordinate Geometry and Differential Equations

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.

SECTION A
(Answer **ANY THREE** questions from this section in Script A)

1. a) What is the role of shift of origin? Find the angle through which the axes to be rotated to (12)
transfer $ax^2 + 2hxy + by^2 = 0$ to the form $AX^2 + BY^2 = 0$.

   b) Write the condition for which the general equation of second degree will represent a conic. (05)

   c) Reduce the equation $36x^2 + 24xy + 29y^2 - 72x + 126y + 81 = 0$ to the standard form and find (18)
its lengths and equation of axes.

2. a) Write the transformation equations to obtain the Cartesian coordinates of a point whose (08)
coordinates are in cylindrical system. Also find the spherical polar coordinates of
$\left(2, -2\sqrt{3}, -4\right)$.

   b) Let the line of shortest distance between the lines $2x - 3y - 4z + 6 = 0 = 2x + 5y - 4z + 7 = 0$ (18)
and $\dfrac{x-5}{-2} = \dfrac{y+3}{3} = \dfrac{z-4}{5}$ intersects at L and M respectively. Obtain the coordinates of them.

   c) Write the different forms of a plane along with the explanations of the role of the constant (09)
present in the equations.

3. a) Obtain the equation of a right circular cylinder of radius 4 whose axis passes through (10)
(3, -1, 4) and (2, 3, 7).

   b) A variable plane is at a constant distance from the origin and meet the axes in A, B, C. Find (12)
the locus of the centroid of the tetrahedron OABC.

   c) Define direction ratios of a line. If a line makes angles α, β, γ with the axes, show that (13)
$\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma = 2$.

4. a) Derive the condition for which $\dfrac{x-x_1}{a_1} = \dfrac{y-y_1}{b_1} = \dfrac{z-z_1}{c_1}$ and $\dfrac{x-x_2}{a_2} = \dfrac{y-y_2}{b_2} = \dfrac{z-z_2}{c_2}$ be (13)
coplanar.

   b) Define sphere. What will be the equation of the tangent plane to the sphere having radius $\sqrt{30}$, (14)
centered at (2, -1, 3) at (3, 4, 5).

   c) Analyze the equations $\dfrac{x^2}{4} + \dfrac{y^2}{9} + \dfrac{z^2}{25} = 1$ and $\dfrac{x^2}{16} - \dfrac{y^2}{4} + \dfrac{z^2}{9} = 1$. (08)

SECTION B
(Answer **ANY THREE** questions from this section in Script B)

5. a) What is meant by order and degree of an ordinary differential equation? Provide examples to (10)
support your answer with explanation.

   b) Obtain the differential equation whose general solution is $y = e^{-3x}(A\cos 4x + B\sin 4x)$. (12)

   c) Show that $y = f_1(x - ct) + f_2(x + ct)$ is the solution of $y_{tt} = c^2 y_{xx}$. (13)

6. a) Solve $(4x - 5y + 3)dx + (x - 3y - 1)dy = 0$. (12)

   b) Solve $\left(D^4 + 2D^3 - 3D^2\right)y = x^2 + 3e^{2x} + 4\sin x$. (12)

   c) Solve $\dfrac{dy}{dx} + 3xy = 9x$. (11)

7. a) Solve $y_2 + 4y = \cos 2x$. (12)

   b) Solve $y_2 - 5y_1 + 6y = xe^{2x} + x^2$. (11)

   c) Solve $y_2 + 4y_1 + 13y = e^{-2x} \sin 6x + e^{-3x} \cos 6x$. (12)

8. a) Obtain the solution of $\dfrac{d^2 y}{dt^2} + 9y = 5\cos 2t$ subject to the conditions $y(0) = 3$ and $y\left(\dfrac{\pi}{2}\right) = -5$. (12)

   b) Obtain the amplitude and the phase angle of the wave that will arise from $\dfrac{d^2 y}{dx^2} + 36y = 0$. (11)

   c) Obtain the solution of $(2x-3)^2 \dfrac{d^2 y}{dx^2} + (2x-3)\dfrac{dy}{dx} + y = \log(2x-3)$. (12)