

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 1st Year 2nd Term Examination, 2015
Department of Computer Science and Engineering
CHEM 1207
Chemistry

TIME: 3 hours

FULL MARKS: 210

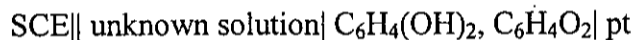
- N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION A

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

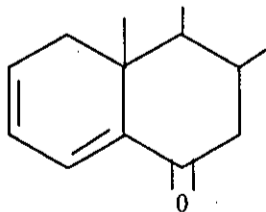
1. a) What is specific conductance? How is the specific conductance of an electrolyte solution determined? (10)
- b) What do you mean by Relaxation effect and Electrophoretic effect? Write down the Debye-Huckel-Onsager Conductance equation for 1:1 electrolyte solution and make a schematic plot of Λ Vs. \sqrt{c} for NaCl and AgCl solution. (10)
- c) State and explain Kohlrausch's law of ionic mobilities. How does it help in determining the equivalent conductance of weak electrolytes? (10)
- d) 0.5 N solution of a salt placed between two platinum electrodes, 20 cm apart and area of cross section 4.0 cm² has a resistance of 25 ohms. Calculate the equivalent conductance of the solution. (05)

2. a) What do you mean by free energy of reaction? Establish thermodynamically the relationship between E and K of cell reaction. Explain the significance of this relation. (12)
- b) What do you mean by Lead acid battery? How does Lead acid battery develop voltage? (07)
- c) What types of solvents are used in Li-ion battery? Explain why Li-ion battery is better than Lead acid battery. (06)
- d) How PH of a solution is determined by using quinhydrone electrode? The emf of the following cell at 25°C is 0.112 V. (10)



If the electrode potential of calomel electrode is 0.242 V, find the PH. ($E_Q^0 = 0.699V$)

3. a) "Increase in polarity of the solvent shifts $\pi \rightarrow \pi^*$ band to longer wave length but $n \rightarrow \pi^*$ and $n \rightarrow \sigma^*$ bands to shorter wave-length" comment on the statement. (10)
- b) Explain the terms with examples: (i) Bathochromic shift (ii) Hypsochromic shift (iii) Hyperchromic effect. (09)
- c) What do you mean by allowed transitions and forbidden transitions? Explain the wavelength as well as the extinction coefficient increases with the increase in conjugation in the compound. (10)
- d) Calculate the λ_{max} for the given structure. (06)



4. a) What is photochemistry? Discuss the differences between photochemical and thermal reactions. (08)
- b) Explain briefly fluorescence and chemiluminescence. What are the origin of the line and band spectra? (13)
- c) How does a glass electrode function? (08)
- d) The quantum yield for the reaction $2H_2O_2 \rightarrow 2H_2O + O_2$ is 3. Calculate the number of photons absorbed in an experiment in which 0.01 mole of H₂O₂ are decomposed. (06)

SECTION B

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

5. a) What is meant by defects in crystal? Discuss about point defect and grain defect. (09)
b) Draw crystalline structure of Si. Discuss a comparative study between Si and Ge. (12)
c) The intercept of a certain plane on the x-axis is $2a/3$ on the y-axis is $2b$ and on the z-axis $1c/3$. Sketch the plane. (06)
d) Discuss about the hexagonal close packed structure of metal. (08)

6. a) "N₂ molecule is diatomic, but He is mono-atomic", Explain with MOT (10)
b) Explain why a σ -bond is stronger than a π -bond? (04)
c) Metals are good conductor of heat and electricity"-Explain. (10)
d) Describe valence bond theory for the complex compound with few of its limitations. (11)

7. a) "Resonance structures are not actual structures of molecule for ions, they exist only in theory"-Explain this with the help of nitrate ion (NO₃⁻) (10)
b) What is conducting polymer? How does polymer conduct electricity? (07)
c) Distinguish between Weiss indices and Miller indices. (08)
d) What is bond order? Write down the condition for effective combination of atomic orbitals to form molecule. (10)

8. a) What do you mean by co-polymer, thermosetting polymer and addition polymer? (12)
b) Discuss the synthesis of Poly vinyl chloride. (08)
c) "In modern time polymers are the best engineering materials"-Explain. (07)
d) Rubber is one of the main natural polymers. Write down its chemical structure. How is it vulcanized? (08)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 1st Year 2nd Term Examination, 2015
Department of Computer Science and Engineering
CSE 1201
Structured Programming

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) Write down the following algebraic expression in C languages. (05)
$$z = p * r \% q + w / x - y$$

b) In admission test of KUET 10000 applicants were participated. Test marks of each student are calculated. Now the admission authority needs a C program to generate the merit list of all applicants. Your task is to help them by writing the required program. (10)

c) Write a program that converts a given seconds into Hour, Minutes and Seconds. (10)

d) Write a program to find out the largest one among three numbers (e.g. 20, 15, 30) using conditional operator only. (10)
Sample Input: 20, 15, 30
Sample Output: 30 is the largest
2. a) What will be the output of following program segment: (08)
for (int i=1; i<=10; printf("%d\n", i))
{
 i++;
}

b) What is null statement? Explain its usefulness. (07)

c) Show the difference between the followings: (12)
(i) else-if ladder and switch.
(ii) break and continue
(iii) while loop and goto
(iv) for loop and do loop

d) What is function prototype? Why is it necessary to use function prototypes in C programs? (08)

3. a) How does implicit type promotion work for the following expression? Explain. (15)
$$y = b - i * f + l / i$$

where y, b, l, f, i are integer, double, short int, float, and long int respectively. Also write down some problems that may occur during implicit type promotion.

b) Explain the four control structures of structured programming. (12)

c) What is dangling else problem? Explain using example(s). (08)
4. a) Is there any difference between character array and string? Explain with example. (07)

b) Define recursion. Write a program to solve the following series using recursion. (12)
$$1^2 + 2^2 + 3^2 + \dots + n^2$$

c) Is increment operator a binary or unary operator? What is the output of following program segment? (06)
int a=-1;
int b=a++;
int c=++b;
printf("%d %d %d", a, b, c);

d) Write a program that converts the last character into opposite case of all words in a given string. (10)

SECTION B

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

5. a) What is structure? What are the techniques of comparing two structure variables? Explain with example. (12)
- b) Define a structure with subject1, subject2, subject3 and total. Now take marks of the three courses for n students. Calculate the total marks of each student. Also calculate the total marks of each courses obtained by n students. (15)
- c) How can you initialized a structure variable? Give example. (08)
6. a) "An array is one type of pointer"-justify the statement with proper example. (11)
- b) What is the difference between call by value & call by reference? Explain with example. (12)
- c) Write a program that reads an array of integers using pointer & prints its elements in reverse order. (12)
7. a) How does a union differ from a structure? Describe with proper examples. (06)
- b) What is the purpose of the typedef feature? Write the output generated by the following program. (08)

```
#include<stdio.h>
typedef union{
    int i;
    float f;
}udef;
void funct (udef u);
main(){
    udef u;
    u.i=100;
    u.f=0.5;
    funct (u);
    printf("%d %f \n", u.i, u.f);
}
void funct( udef u) {
    u.i=200;
    printf("%d %f \n", u.i, u.f);
    return;
}
```

- c) Differentiate between malloc and calloc with their declarations. How can we change the size of allocated memory? (10)
- d) In the following enumeration declaration, determine the value of each member. (04)
- ```
Enum compass { north= -2, south, east=1, west};
```
- e) What is the meaning of "-I." and "-c" in GCC options. State the difference between compilation flag "-I." and without "-I." in GCC command. For example: (07)
- ```
gcc -o output_file_name source_file.c
gcc -o output_file_name source_file.c -I.
```
8. a) What is structure padding? How to avoid structure padding? Describe with proper examples. (09)
- b) Use the "stringizing" and "token-pasting" operator to define a macro called display (s, i) that will give output: (10)
- Display→x3=6
- where,
- ```
main(){
 int x3=6;
 //call display macro with proper parameters
}
```
- c) Suppose, you have 4 files (Test1.c, Test2.c, Test3.c, Test.h). Write an efficient Makefile for these files using dependencies, variables and proper comments. (10)
- d) What is Error Handling in C? Write a program for handling the divide by zero errors. (06)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY  
 B.Sc. Engineering 1st Year 2nd Term Examination, 2015  
 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) What do you mean by self-complementing code? Explain. (07)
- b) State duality principle. Show that the dual of X-OR is equal to its complement. (06)
- c) There is a strong room having an electric locks with four keys. The keys have the following weights. (08)

| Key no. | Weights |
|---------|---------|
| 1       | 45      |
| 2       | 35      |
| 3       | 15      |
| 4       | 20      |

The lock is opened if at least 38 weights are present. Design a combinational circuit for the lock.

- d) Implement the following Boolean functions with NAND gates by means of Block Diagram method. (09)

(i)  $F = B(AC + D) + AD'$

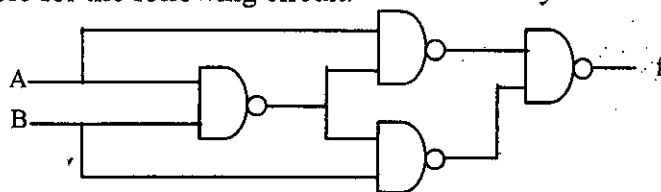
(ii)  $F = (A + BD')(CD + E')$

Both the normal and complement inputs are available.

- e) Is it possible to replace a 4 input NOR gate with 2 input NOR gates? Justify your answer. (05)

2. a) What is a combinational circuit? Design an even parity generator for 3-bit message using combinational circuit design method. (11)
- b) What is carry propagation delay in a full adder circuit? Show that carry propagation problem can be eliminated by designing a carry look ahead generator. (10)
- c) What is priority Encoder? Explain it using example. (07)
- d) Design a combinational circuit which compares the magnitude of two 6 bit binary numbers. (07)

3. a) Find the truth table for the following circuit. (06)



- b) What is the significance of Quadruple 2 to 1 line multiplexer? Implement the following function with a multiplexer. (12)

$$F(A, B, C, D) = \sum(0, 1, 3, 6, 7, 12, 13, 15)$$

- c) Simply the following Boolean function by means of Tabulation method. (12)

$$F(A, B, C, D) = \pi(0, 2, 3, 5, 12, 13, 14)$$

- d) Implement the following functions using PAL. (05)

$$F_1 = AB' + AC$$

$$F_2 = AC' + BC$$

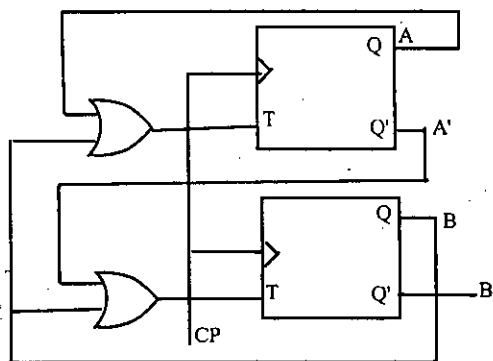
$$F_3 = AB + B'C + ABC$$

4. a) Design a 4096 bit ROM whose word size is 4 bit. (06)
- b) Design a 1:8 demultiplexer using 2 to 4 line decoder. (08)
- c) What do you mean by PAL and PLA? State the relative advantages of PLA over ROM. (10)
- d) Develop the PLA program table for a combinational circuit that squares a 3-bit number. (11)

**SECTION B**

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

5. a) What is a sequential circuit? Explain the models of sequential circuit using example(s). (10)  
 b) Analyze the following circuit in terms of (i) input equations; (ii) state table and (iii) state diagram. What is the function of the circuit? (14)



- c) "If  $Q'$  output of a D flip flop is connected to the D input then it acts as T flip-flop"- (06)  
 Justify the statement.
- d) Differentiate between a register and a latch. (05)
6. a) What is an asynchronous counter? Design a decade binary asynchronous counter with JK Flip-flops. (10)  
 b) What is synchronous counter? Design a synchronous using JK flip-flops for the binary sequence 0, 3, 4, 7 and repeat. (12)  
 c) Is it possible to generate timing signal with a combination of shift register & decoder? (07)  
 Justify your answer.  
 d) The content of a 4-bit shift register is initially 1101. The register is shifted six times to the right with the serial input 101101. What is the content of the register after each shift? (06)
7. a) What is race-around condition & how does it arise in JK flip-flop? Explain Master-Slave technique to resolve race-around condition in JK flip-flop. (11)  
 b) A hardware engineer is asked to design a sequence detector. The detector will examine a string of 0's and 1's applied to the x input and generate an output  $z = 1$  only when a prescribed input sequence occurs. The detector circuit needs to be designed so that any input sequence ending in 101 will produce an output  $z = 1$  coincided with last 1. The circuit does not reset when a 1 output occurs. A typical input and output are given as follows: (14)  
 $x = 0011011001010100$   
 $z = 000001000010100$
- c) Explain the difference between serial and parallel transfer. What type of register is used in each case? Explain. (10)
8. a) What is a ripple counter? Draw the circuit diagram of a 3-bit binary ripple counter and explain its operation. (10)  
 b) Design a serial adder using sequential logic procedure. (12)  
 c) Reduce the number of states in the following state table and tabulate the reduced state table. (13)

| Present state | Next state |         | Output  |         |
|---------------|------------|---------|---------|---------|
|               | $x = 0$    | $x = 1$ | $x = 0$ | $x = 1$ |
| a             | f          | b       | 0       | 0       |
| b             | d          | c       | 0       | 0       |
| c             | f          | e       | 0       | 0       |
| d             | g          | a       | 1       | 0       |
| e             | d          | c       | 0       | 0       |
| f             | f          | b       | 1       | 1       |
| g             | g          | h       | 0       | 1       |
| h             | g          | a       | 1       | 0       |

Table 8(c): State table

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY  
 B.Sc. Engineering 1st Year 2nd Term Examination, 2015  
 Department of Computer Science and Engineering  
 EEE 1217  
 Analog Electronics

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 do you mean by doping of semiconductor? Explain how depletion layer is formed in p-n junction? (10)
- b) A half-wave rectifier is used to supply 50V d.c. to a resistive load of 800  $\Omega$ . The diode has a resistance of 25  $\Omega$ . Calculate the value of a.c voltage required. (08)
- c) Explain how filter circuit removes the a.c component of rectifier output. (10)
- d) Determine the value of  $I$ ,  $V_1$ ,  $V_2$  and  $V_0$  for the circuit of Fig. 1(d). (07)

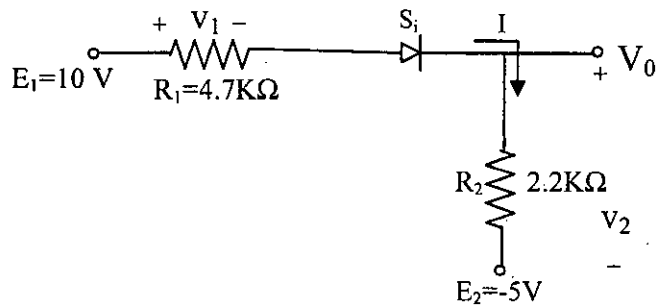


Fig. 1(d)

2. a) Explain why transistor is so called? (06)
- b) Define load line and operating point. In the following circuit (Fig. 2(b))  $V_{CC}=12$  V,  $R_C=6K\Omega$ . Draw the load line. What will be the Q-point if base current 20  $\mu$ A and  $\beta=50$ . (13)

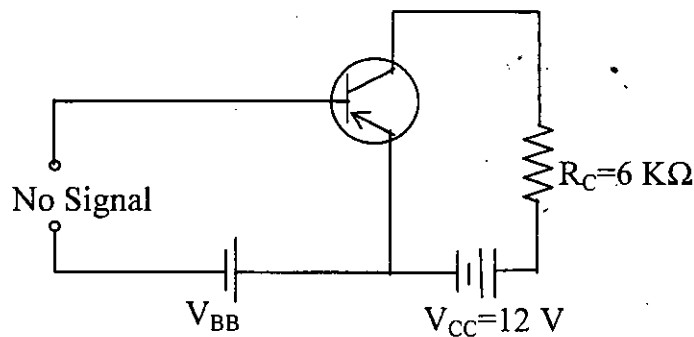


Fig. 2(b)

- c) Draw the ac equivalent circuit of voltage divider biasing circuit. (06)
- d) Determine the dc level of  $I_B$  and  $V_C$  for the network of Fig. 2(d). (10)

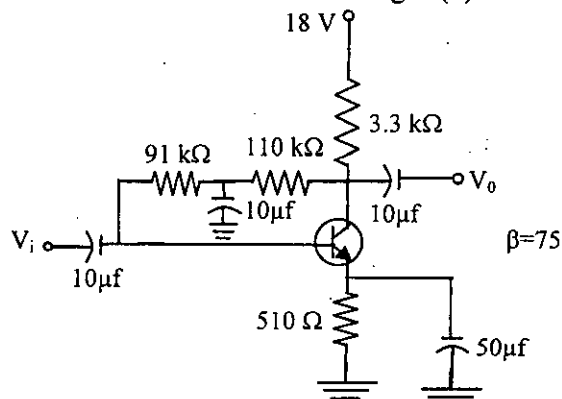


Fig. 2(d)

3. a) Why JFET is called a voltage control device? Explain How the operating conditions are controlled by gate voltage. (12)
- b) Describe in your own words the operation of the network of Fig 3(b) with  $V_i=0$  V. (10)

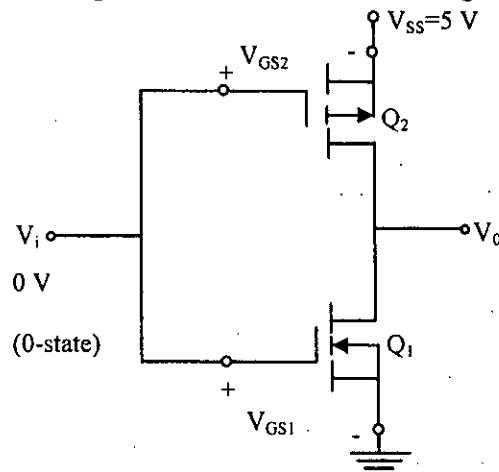


Fig. 3(b)

- c) Sketch the transfer curve defined by  $I_{DSS}=12$  mA and  $V_P=-6$  V by applying short hand method only. (07)
- d) Why insulating layer of  $SiO_2$  is used in the MOSFET construction? (06)
4. a) Establish the following relations: (10)

$$(i) I_c = \frac{\alpha}{1-\alpha} I_B + \frac{I_{CBO}}{1-\alpha} \quad (ii) I_c = \beta I_B + I_{CEO}$$

- b) Determine  $R_C$ ,  $R_B$ ,  $V_{CE}$  and  $V_B$  for the following circuit (Fig. 4(b)). (06)

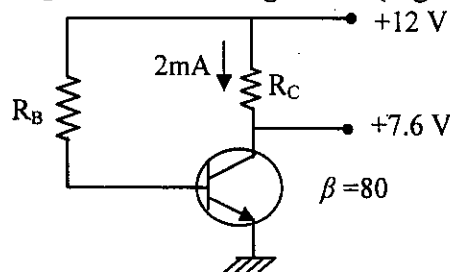


Fig. 4(b)

- c) Define hybrid parameters. Draw the hybrid model of common-base configuration and common-emitter configuration. (10)
- d) Describe the construction and working principle of a n-p-n transistor. (09)

### SECTION B

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

5. a) What is operational amplifier? Why they are so called? (05)
- b) Write short notes on: (i) Summer (ii) Integrator and (iii) Differentiator. (15)
- c) Define CMRR. Show that the output voltage of a differential amplifier is proportional to the difference of the two input voltages. (11)
- d) Define slew rate and input offset current of an op-amp. (04)
6. a) Explain the construction and operation of a SCR. (12)
- b) What do you mean by holding current and latching current? Draw the two transistor model of an SCR. (10)
- c) For an UJT relaxation oscillator show that  $f \approx \frac{1}{R_1 C \ln\left[\frac{1}{1-n}\right]}$  (13)
7. a) What are the essential parts of an oscillator? Explain the principle of operation of RC phase shift oscillator. (15)
- b) The ac equivalent circuit of a crystal has the values of  $L=1$  H,  $C=0.01$  pF,  $R=1000$   $\Omega$  and  $C_m=20$  pF. Calculate  $f_s$  and  $f_p$  of the crystal. (10)
- c) Mention the differences of an alternator and an oscillator. What are the Limitations of LC and RC oscillators? (06)
- d) What do you mean by damped and un-damped oscillation? (04)
8. a) Draw the characteristics curve of DIAC and TRIAC. (06)
- b) Classify IC. What is Monolithic IC? Explain different steps of making Monolithic IC. (12)
- c) Draw the frequency response curve of all types of active filters. (12)
- d) What is LASCR? Explain briefly. (05)



KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY  
 B.Sc. Engineering 1st Year 2nd Term Examination, 2015  
 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) Determine the transformed equation of  $11x^2 + 24xy + 4y^2 - 20x - 40y - 5 = 0$  of which the origin remain unchanged and the direction of axis is rotated through an angle  $\tan^{-1}(-\frac{4}{3})$ . (12)
- b) Define invariants. Find the rotation angle of axis for which the  $xy$ -term from the expression  $ax^2 + 2hxy + by^2$  must be removed. (13)
- c) Write down the general equation of 2<sup>nd</sup> degree. Also write the conditions for which it represents: (i) a pair of straight lines. (ii) a parabola and (iii) an ellipse. (10)
2. a) Find the nature and centre of the conic  $x^2 + 4xy + y^2 - 2x + 2y - 6 = 0$ . (08)
- b) Reduce the equation  $x^2 - 5xy + y^2 + 8x - 20y + 15 = 0$  to the standard form and find its equations of axes and latus rectums. (15)
- c) Show that the straight lines  $x + 3y + 2z + 1 = 0 = 2x - y - 2z - 1$  and  $-x + 2y + 3z + 1 = 0 = -3x - y - 2z + 1$  are co-planar. (12)
3. a) Define direction cosines of a line. Prove that  $l^2 + m^2 + n^2 = 1$ , where  $l, m, n$  are the direction cosines of a line. (10)
- b) Find the equation of the plane which is perpendicular to the plane  $5x + 3y + 6z + 8 = 0$  and contains the line of intersection of the planes  $x + 2y + 3z - 4 = 0$  and  $2x + y - z + 5 = 0$ . (12)
- c) Find the shortest distance and its equation between two lines  $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$  and  $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$ . (13)
4. a) Find the equation of sphere in which the circle  $x^2 + y^2 + z^2 + 10y - 4z - 8 = 0, x + y + z - 3 = 0$  is a great circle. (12)
- b) A plane meets the co-ordinate axes in A, B, C such that the centroid of the triangle ABC is the point  $(p, q, r)$ . Prove that the equation the of plane is  $\frac{x}{p} + \frac{y}{q} + \frac{z}{r} = 3$ . (11)
- c) Define right circular cone. Fine the semi-vertical angle of the cone represented by  $2(x^2 + y^2) - 3z^2 = 0$  and also find its axis. (12)

**SECTION B**

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

5. Solve ANY THREE of the followings: (35)
- (i) Define order of a differential equation with an example. Find the differential equation of  $xy = ae^x + be^{-x} + x^2$ , where "a" and "b" are arbitrary constants.
  - (ii) Solve the D.E.,  $(2xy + 3y^2)dx - (2xy + x^2)dy = 0$
  - (iii) Solve the D. E.,  $y(xy + 1)dx + x(1 + xy + x^2y^2)dy = 0$
  - (iv) Solve the D. E.,  $\frac{dy}{dx} - y = xy^5$ .
6. Answer ANY THREE of the followings: (35)
- (i) Solve  $(x + y - 3)dx = (3x - y - 1)dy$
  - (ii) Solve  $ydx - xdy = \sqrt{x^2 + y^2} dx$
  - (iii) Solve  $(xy^2 + 2x^2y^3)dx + (x^2y - x^3y^2)dy = 0$
  - (iv) Solve  $\frac{dy}{dx} = 1 + 3y \tan x$
7. Answer ANY THREE of the followings: (35)
- (i) Find a particular solution of  $y'' + 3y' + 2y = 2$  when  $y(0) = 1$  and  $y'(0) = 2$ .
  - (ii) Solve  $(D^3 + 3D - 4)y = xe^{-2x}$
  - (iii) Solve  $(D^3 - 6D^2 + 11D - 6)y = e^{2x}$  by the method of variation of parameter.
  - (iv) Solve  $\frac{d^2y}{dx^2} - 3y\frac{dy}{dx} + 4y = \cos(4x + 5)$
8. a) Find the series solution of the following D.E  $(1 - x^2)y'' - 2xy' + 2y = 0$ . (20)
- b) Form partial differential equations by eliminating arbitrary constants from the following equations:
- (i)  $z = ax + (1 - a)y + b$  (07)
  - (ii) The equation of plane  $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ , where  $a + b + c = 0$  (08)