

Total No. of Questions : 5]

SEAT No. :

P5121

[Total No. of Pages : 3

[5823]-101

F.Y. B.Sc. (Computer Science)

**CS-111 : Problems Solving Using Computer and 'C'
Programming**

(2019 Pattern) (CBCS) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data if necessary.*

Q1) Attempt any Eight of the following :

[8 × 1 = 8]

- a) What is a compiler?
- b) What is linker?
- c) Define pseudocode.
- d) List the various data types in 'C' language.
- e) What is the use of break & continue statement.
- f) Write the syntax for nested if - else loop.
- g) State the use of rewind () function.
- h) List the different storage classes.
- i) List the types of arrays.
- j) State the applications of arrays.

Q2) Attempt any Four of the following :

[4 × 2 = 8]

- a) Define algorithm. Explain its characteristics.
- b) Evaluate the following expressions assuming a is integer type variable.
 - i) $a = 3/2 * 4 + 3/8$
 - ii) $a = 2 * 3/4 + 4/4 + 8 - 2 + 5/8$

P.T.O.

- c) Explain for loop with example.
- d) Explain the following function with example.
 - i) `isupper()`
 - ii) `isalpha()`
- e) Explain how can be declare and initialize 2D arrays.

Q3) Attempt any Two of the following : **[2 × 4 = 8]**

- a) Write an algorithm and flowchart for swap of two numbers.
- b) Write a 'C' program to check whether a number is palindrome or not.
- c) Explain recursive functions with example.

Q4) Attempt any Two of the following : **[2 × 4 = 8]**

- a) Trace the output for the following :

- i)

```
#include <stdio.h>

int main( )
{
    int arr[ ] = {2, 3, 4, 1, 6};
    printf("%u, %u, %u\n", arr, & arr[0], & arri);
    return 0;
}
```

- ii)

```
# include <stdio.h>

main ( )
{
    int i :
    for(i = 0; i < 5, i ++)
        printf("%d", i);
    return 0;
}
```

- b) Explain the working of switch - case with syntax and example.
- c) Explain arithmetic, relational and conditional operators.

Q5) Attempt any one of the following :

[1 × 3 = 3]

- a) Write a program in 'C' to find whether the number is even or odd using functions.
- b) Write a 'C' program to accept $m \times n$ matrix and print sum of all elements of a matrix.



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SEAT No. :

P5122

[Total No. of Pages : 3

[5823]-102

F.Y. B.Sc. (Computer science)

CS - 112 : DATABASE MANAGEMENT SYSTEMS

(2019 Pattern) (Semseter - I) (CBCS)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Attempt any EIGHT of the following :

[8 × 1 = 8]

- a) Enlist users of DBMS.
- b) Define decomposition.
- c) Define second normal form.
- d) What do you mean by domain of an attribute?
- e) Define an entity.
- f) What is a foreign key?
- g) What is DDL?
- h) What is view?
- i) List any two aggregate functions in SQL.
- j) What is Right Outer Join?

Q2) Attempt any FOUR of the following :

[4 × 2 = 8]

- a) Differentiate between 3NF and BCNF.
- b) What is use of check constraint? Give the syntax of check constraint in a column definition.
- c) Define strong and weak entity sets.
- d) What is DML? Write any one example of DML.
- e) Describe the term nested subquery with example.

P.T.O.

Q3) Attempt any TWO of the following :

[2 × 4 = 8]

- a) What is data abstraction? What are different levels of data abstraction?
- b) Differentiate between Generalization and Specialization.
- c) What is attribute? Explain different types of attributes.

Q4) Attempt any TWO of the following :

[2 × 4 = 8]

- a) Consider $R = (A, B, C, D, E)$ and set of FDs defined on R as
 $F = \{A \rightarrow B, A \rightarrow C, CD \rightarrow E, B \rightarrow D, E \rightarrow A\}$, Compute closure of F i.e. F^+ .
- b) Consider the following relational database :

Sailors (sid, sname, rate, age)

Boats (bid, bname, colour)

Reserves (sid, bid, day)

Write SQL statement for each of the following queries.

- i) Find name and ages of all Sailors.
 - ii) Find all the Sailors with a rating above 6.
 - iii) Find the sids of Sailors who have reserved a red boat.
 - iv) Find colours of boats reserved by Amol.
- c) Consider the following entities and relationships :
Game (g_no, gname, no_of_players, coach_name_captain)
Player (p_no, p_name)
Game and Players are related with many-to-many relationships.
Create Relational Database for the above and solve the following queries in SQL.
- i) List the name of players playing 'basketball' and 'handball'.
 - ii) List the name of players playing game 'cricket'.
 - iii) Count the total numbers of players whose coach name is 'mr.sharma'

Q5) Attempt any ONE of the following :

[1 × 3 = 3]

- a) What are Armstrong's Axioms?
- b) Construct an E-R diagram for a car insurance company that has a set of customers. Each customer owns one or more cars. Each are associated with more cars. Each can be associated with zero to any number of recorded accidents.



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SEAT No. :

P5123

[Total No. of Pages : 3

[5823]-103

F.Y. B.Sc. (Computer Science)

MATHEMATICS

MTC - 111 : Matrix Algebra

(2019 Pattern) (Semester - I) (Paper-I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of single memory, non-programmable scientific calculator is allowed.

Q1) Attempt any five out of seven.

[10]

- a) Describe the nature of solution for the following system of linear equations.

$$x + y = 6$$

$$3x + 3y = 18$$

- b) If $u = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$, $v = \begin{bmatrix} 1 \\ 3 \end{bmatrix}$, then compute, $u + v$, $u + 5v$.

- c) Is the following matrix in reduced row echelon form? Justify $\begin{bmatrix} 1 & 2 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$.

- d) If $A = \begin{bmatrix} 3 & -2 \\ 5 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 4 \\ 6 & -7 \end{bmatrix}$. Find, $A - 4B + 7I_2$.

- e) Determine whether the following matrix is invertible or not. If yes find its

$$\text{inverse } A = \begin{bmatrix} 8 & 1 \\ 5 & 2 \end{bmatrix}.$$

P.T.O.

- f) Write the standard matrix for the transformation that gives reflection through the x_1 -axis.
- g) If A is 3×7 matrix and $\text{nullity}(A) = 4$, then find the rank (A).

Q2) Attempt any three out of five.

[15]

- a) Compute the solution of the following system by using Cramer's rule.

$$5x_1 + 7x_2 = 3$$

$$2x_1 + 4x_2 = 1$$

- b) Solve the following system of linear equations.

$$x_2 + 4x_3 = -5$$

$$x_1 + 3x_2 + 5x_3 = -2$$

$$3x_1 + 7x_2 + 7x_3 = 6$$

- c) If A is an $m \times n$ matrix, $u, v \in \mathbb{R}^n$ and C is a scalar, then prove that,

a) $A(u+v) = Au + Av$

b) $A(Cu) = C(Au)$

d) Let, $V_1 = \begin{bmatrix} 1 \\ 0 \\ -1 \\ 0 \end{bmatrix}, V_2 = \begin{bmatrix} 0 \\ -1 \\ 0 \\ 1 \end{bmatrix}, V_3 = \begin{bmatrix} 1 \\ 0 \\ 0 \\ 1 \end{bmatrix}.$

Does $\{V_1, V_2, V_3\}$ Span \mathbb{R}^4 ? Justify.

- e) Let, $T : \mathbb{R}^2 \rightarrow \mathbb{R}^3$ be a linear transformation, such that $T(x_1, x_2) = (x_1 - 2x_2, -x_1 + 3x_2, 3x_1 - 2x_2)$. Find X such that, $T(X) = (-1, 4, 9)$.

Q3) Attempt any one out of two questions.

[10]

- a) Find basis for col A and Nul A of the following matrix A.

$$A = \begin{bmatrix} 3 & 3 & 1 & -5 \\ -9 & -4 & 1 & 7 \\ 9 & 2 & -5 & 1 \end{bmatrix}$$

Also find rank and nullity of A.

- b) i) Find the volume of the following parallelepiped with one vertex at the origin and adjacent vertices are $(1, 0, -3)$, $(1, 2, 4)$ and $(5, 1, 0)$.
ii) Solve the following system of linear equations.

$$x_1 + x_3 = 2$$

$$-2x_1 + x_2 - 6x_3 = -1$$

$$x_2 + 8x_3 = 6$$



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SEAT No. :

P5124

[Total No. of Pages : 3

[5823]-104

F.Y. B.Sc. (Computer Science)

MATHEMATICS

MT - C 112 : Discrete Mathematics

(2019 Pattern) (Semester - I) (Paper - II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Figures to the right indicate full marks.
- 4) Neat diagrams must be drawn whenever necessary.
- 5) Use of single memory, non-programmable scientific calculator is allowed.

Q1) Attempt any five of the following : [5]

- a) Let p and q be the propositions having truth values 'True' and 'False' respectively. Find the truth value of the compound statement $(p \rightarrow q) \wedge (\sim q)$.
- b) Is D_{18} with the 'divides' relation a Boolean algebra? Justify.
- c) Give an example of a relation on the set $A = \{1, 2, 3\}$ which is reflexive and symmetric but not transitive.
- d) Show that in a group of 13 people, there must be at least two having birthday in the same month.
- e) Find the number of three digit numbers divisible by 5 which can be formed by using the digits 1, 2, 3, 4 and 5, if repetition of digits is allowed.
- f) Find a_4 , if the sequence $\{a_n\}$ is defined by the recurrence relation $a_n = a_{n-1} + a_{n-2}$; $a_0 = 1, a_1 = 1$

Q2) a) Find the number of integers from 1 to 500 (both inclusive) which are [6]
i) divisible by 2 or 3 or 5.
ii) neither divisible by 2 nor by 3, nor by 5.

OR

P.T.O.

Draw Hasse diagram for D_{45} with the partial order relation 'divides'.

Find glb (3, 15) and lub (9, 5).

Is it a complemented lattice? Justify. [6]

b) Test the validity of the following argument. [4]

$$(p \rightarrow r) \rightarrow \sim s, q \rightarrow r, p \rightarrow q, s \vee t \vdash t$$

Q3) a) Find conjunctive normal form of the function [6]

$$f(x, y, z) = \bar{x} \vee (y \wedge (\bar{z} \vee x)).$$

OR

Solve the following recurrence relation. [6]

$$a_r - 7a_{r-1} + 10a_{r-2} = 3^r, a_0 = 0, a_1 = 1.$$

b) Let $Q(x, y)$ be the statement " x has sent email message to y ", where the universe of discourse for both x and y consists of all students in your class. Express each of the following quantification in English. [4]

i) $\exists x \exists y Q(x, y)$

ii) $\exists x \forall y Q(x, y)$

iii) $\forall x \exists y Q(x, y)$

iv) $\exists y \forall x Q(x, y)$

Q4) a) Using Warshall's algorithm, obtain transitive closure of the relation [6]

$$R = \{(1, 2), (2, 2), (2, 4), (3, 2), (3, 4), (4, 1)\}$$

on the set $A = \{1, 2, 3, 4\}$.

OR

Prove that if there are n_1 indistinguishable objects of type 1, n_2 indistinguishable objects of type 2, ----- n_k indistinguishable objects of type k , where $n_1 + n_2 + \dots + n_k = n$, then the number of permutations of

these n objects is $\frac{n!}{n_1! n_2! \dots n_k!}$. [6]

Hence find number of arrangements of the letters in the word 'MATHEMATICA'

b) Let R be the relation on the set $\{1, 2, 3, 4\}$ defined by ' $x R y$ if and only if $|x - y| = 1$ '. Draw the digraph of R . Also write matrix of R . [4]

Q5) Attempt any two of the following :

- a) Let $[B, \bar{}, \vee, \wedge]$ be a Boolean algebra. For elements $a, b \in B$, Prove that $\overline{a \wedge b} = \bar{a} \vee \bar{b}$. [5]
- b) Solve : $a_r - a_{r-1} - 12 a_{r-2} = 0$, $a_0 = 0, a_1 = 1$. [5]
- c) Show that if any 11 numbers are chosen from the set $\{1, 2, \dots, 20\}$, then one of them will be a multiple of the other. [5]



Total No. of Questions : 5]

SEAT No. :

P5125

[Total No. of Pages : 2

[5823]-105

F.Y. B.Sc. (Computer science)

ELECTRONIC SCIENCE

**ELC - 111 : Semiconductor Devices and Basic Electronic
Systems (Backlog)**

(CBCS) (2019 Pattern) (Semester - I) (Paper - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Questions 2 to 5 carry equal marks.*
- 4) *Draw neat labeled diagrams wherever necessary.*

Q1) Solve any five of the following :

[5 × 1 = 5]

- a) Draw symbols for :
 - i) LED
 - ii) Zener diode
- b) What is piezoelectric effect?
- c) State types of MOSFET.
- d) Define knee voltage.
- e) "IC 555 astable multivibrator is used as a clock" _ state true or false.
- f) What is output voltage of IC 7805?

Q2) Answer the following :

- a) Explain construction and working of opto coupler. **[4]**
- b) Explain working of transistor as a switch. **[3]**
- c) Draw block diagram of SMPS and explain its operation in brief. **[3]**

Q3) Answer the following :

- a) Define the terms α , β and γ with reference to transistor. State the relationship between α and β . **[4]**

P.T.O.

- b) Draw diagram of full wave rectifier using two diodes with filter capacitor. Define ripple factor. [3]
- c) Draw diagram of IC 555 timer. For $R_A = 8k\Omega$, $R_B = 4k\Omega$ and $C = 0.1\mu F$; calculate the output frequency. [3]

Q4) Answer the following :

- a) Explain working of zener diode as a voltage regulator. [4]
- b) State Barkhausen Criteria for sustained oscillations. Find output frequency of wien bridge oscillator [3]
if $R_1 = 1k\Omega$, $C = 0.22\mu f$;
- c) Draw diagram of 2 bit flash ADC and explain its working. [3]

Q5) Attempt any four of the following : [4 × 2.5 = 10]

- a) Explain need of Digital to Analog converter.
Draw diagram of R-2R ladder network.
- b) Write a short note on crystal oscillator.
- c) Explain how MOSFET works as a switch.
- d) Draw block diagram of successive approximation ADC.
- e) Write a short note on potential divider bias of transistor.
- f) Draw block diagram of off - line UPS.



Total No. of Questions : 5]

SEAT No. :

P5126

[Total No. of Pages : 2

[5823]-106

F.Y. B.Sc. (Computer Science)

ELECTRONICS SCIENCE

ELC 112 : Principles of Digital Electronics

(2019 Pattern) (CBCS) (New) (Paper - II) (Semester - I)

Time : 2 Hours]

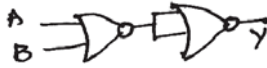
[Max. Marks : 35

Instructions to the candidates:

- 1) Q. 1 is compulsory.
- 2) Solve any Three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

Q1) Solve any Five of the following :

[5 × 1 = 5]

- a) $(1)_2 - (1)_2 - (1)_2 = (?)_2$
- b)  • This gate is (i) OR (ii) NOR (iii) AND
- c) For a multiplexer with 60 inputs, find out the number of control lines.
- d) Full form of ASCII is _____.
- e) $\bar{A} + \bar{B} =$ _____.
- f) State the function of IC 7447.

Q2) a) i) Give rules for binary addition of two bits. Perform $(1100.010)_2 + (10.1110) + (1010)_2$ [3]

ii) Using rules of Boolean algebra simplify [3]

$$M = \bar{X}\bar{Y}\bar{Z} + \bar{X}Y\bar{Z} + X\bar{Y}Z + XY\bar{Z}$$

- b) With neat logic diagram explain the working of 4 bit universal adder subtractor. [4]

P.T.O.

Q3) a) i) Convert the following expression into standard POS form. [3]

$$Y = (\bar{A} + \bar{B})(\bar{B} + C)(\bar{A} + C)$$

ii) Draw the logic diagram for 3 bit adder and write its truth table. [3]

b) Perform the following : [4]

i) $(1011101)_2 = (?)$ Gray

ii) $(110101)_2 = (?)$ BCD

Q4) a) i) Simplify the following expression using K map. [3]

$$A = \bar{X}\bar{Y}Z + \bar{X}\bar{Y}\bar{Z} + XY\bar{Z} + \bar{X}Y\bar{Z} + \bar{X}YZ$$

ii) Draw the logic circuit diagram for BCD to seven segment conversion. Give the logic levels to display digit '3' on common anode display. [3]

b) Draw the logic diagram for the given Boolean expression and write the truth table for it [4]

$$Y = \overline{\bar{A}BC\bar{D} + (A + \bar{C}) + BD}$$

Q5) Attempt any Four of the following : [4 × 2½ = 10]

- Write a short note on Hexadecimal number system.
- Write a short note on universal gates.
- Write a short note on IC 74138.
- What is a Gray code? Where is it used?
- Explain how EX-OR gates can be used as controlled inverter.
- Explain the concept of parity bits. Where are parity bits used?



Total No. of Questions : 5]

SEAT No. :

P5127

[Total No. of Pages : 3

[5823]-107

F.Y. B.Sc. (Computer Science)

STATISTICS

CSST-111 : Descriptive Statistics - I

(2019 Pattern) (Semester - I) (Paper - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator and statistical tables is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

Q1) Choose the most appropriate alternative for each of the following : **[4]**

- i) If the classes are 0 - 2, 2 - 4, 4 - 6, 6 - 8, 8 - 10. Then the class width is
 - a) 4
 - b) 10
 - c) 2
 - d) 5
- ii) The number of quartiles are
 - a) 4
 - b) 10
 - c) 100
 - d) 3
- iii) Mode can be obtained graphically by using
 - a) histogram
 - b) less than type cumulative frequency curve
 - c) more than type cumulative frequency curve
 - d) ogive curves
- iv) If $(Q_3 - Q_2) > (Q_2 - Q_1)$, then the distribution is
 - a) symmetric
 - b) positively skewed
 - c) negatively skewed
 - d) leptokurtic

P.T.O.

Q2) Attempt any FIVE of the following :

[5 × 2 = 10]

- i) Define the terms :
 - a) Attribute
 - b) Variable
- ii) Construct stem and leaf plot for the following data :
15, 22, 12, 34, 28, 45, 31, 22, 26, 21
- iii) Define less than type cumulative frequency.
- iv) The mean monthly salary of 100 male employees is Rs. 20,000/-. The mean monthly salary of 50 female employees is Rs. 22,000/-. Find mean monthly salary of all the employees taken together.
- v) Examine whether the following data is consistent or not?
 $N = 200, (A) = 150, (B) = 80, (AB) = 25$
- vi) Express the second and third central moment in terms of raw moments.
- vii) State the relation between mean, median and mode for
 - a) symmetric distribution
 - b) positively skewed distribution
- viii) What is dispersion. State different measures of dispersion?

Q3) Attempt any TWO of the following :

[2 × 4 = 8]

- i) Explain inclusive and exclusive methods of classification.
- ii) Write a note on Box plot.
- iii) Define Arithmetic Mean. State its merits.

Q4) Attempt any TWO of the following :

[2 × 4 = 8]

- i) Define the following terms :
 - a) Dichotomous classification
 - b) Order of a class
 - c) Positive class
 - d) Ultimate class frequency
- ii) Write a note on kurtosis.
- iii) Compute Yule's coefficient of association for the following data :
 $N = 20, (A) = 12, (B) = 10, (AB) = 8$

Q5) Attempt any one of the following :

[1 × 5 = 5]

- i) The following data is related with the two workers doing same job in company.

	Worker A	Worker B
Mean time of completing the job (in minutes)	40	42
Standard deviation (minutes)	8	6

Which worker is more consistent?

- ii) Define skewness. Explain types of skewness with the help of sketch.



Total No. of Questions : 4]

SEAT No. :

P5128

[Total No. of Pages : 3

[5823]-108

F.Y. B.Sc. (Computer Science)

STATISTICS

CSST - 112 : Mathematical Statistics (Paper - II)

(2019 Pattern) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of non-programmable scientific calculator and statistical tables is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following :

[1 each]

A) Fill in the blanks :

- i) Suppose A and B are two independent events defined on sample space then $P(A \cap B) = \underline{\hspace{2cm}}$.
- ii) The variance of geometric distribution with parameter 'p' is $\underline{\hspace{2cm}}$.

B) Choose the most appropriate alternative for each of the following :[1 each]

- i) The probability that there are 53 Sundays in randomly chosen leap year is

a) $\frac{2}{7}$

b) $\frac{1}{14}$

c) $\frac{1}{28}$

d) $\frac{1}{7}$

- ii) If x is a continuous random variable with distribution function F(x) then which of the following is NOT true?

- a) F(x) is non-negative function of x
- b) F(x) is non-decreasing function of x
- c) F(x) is right continuous function of x
- d) F(x) is step function of x

- iii) If x is a discrete random variable with $E(x) = 3$ then $E(2x + 5) = \underline{\hspace{2cm}}$

a) 3

b) 6

c) 11

d) 12

P.T.O.

Q2) Attempt any Two of the following :

[2 × 5 = 10]

- A) Explain the terms :
- i) Non-deterministic experiments
 - ii) Addition principle of counting
- B) Define each of the following :
- i) Sure event
 - ii) Mutually exclusive events
 - iii) Conditional probability
 - iv) Sample space
 - v) Mathematical expectation of discrete random variable (r.v.) X
- C) The software gives 4 digit numbers by using digits 0-9 at random. Assuming that no digit is repeated, find the probability that,
- i) The number is greater than 5000.
 - ii) The number is divisible by 5.

Q3) Attempt any Two of the following :

[2 × 5 = 10]

- A) Explain the term independent events. Also show that, if A and B are independent events then
- i) A^c and B are also independent.
 - ii) A^c and B^c are also independent.
- B) Following is the probability mass function of a discrete r.v. X :

X	0	1	2	3	4
P(x)	0.2	0.15	0.3	0.25	0.1

Find :

- i) $P[X \text{ is even}]$
 - ii) distribution function of X.
 - iii) mode of X.
- C) Define discrete uniform distribution. State its mean and variance. Also give two real life situations where the distribution is applicable.

Q4) Attempt any One of the following :

- A) i) State each of the following : [6]
- 1) Poisson approximation to binomial distribution
 - 2) Additive property of Poisson distribution
 - 3) Bayes' theorem
- ii) The probability density function of a continuous r.v. X is : [4]
- $$f(x) = k(4x - 2x^2), 0 \leq x \leq 2$$
- $$= 0, \quad \text{otherwise}$$
- Find :
- 1) the value of k.
 - 2) $E(X)$.
- B) i) Define binomial distribution. State its mean and variance. Also state Bernoulli distribution as particular case of binomial distribution. [5]
- ii) A shooter is hitting at a target. The probability of hitting a target at any shoot is 0.6. What is the probability that he will hit the target on 5th attempt for the first time? Also obtain expected number of shoots required to hit the target for the first time. [5]



Total No. of Questions : 5]

SEAT No. :

P5129

[5823] - 201

[Total No. of Pages : 2

First Year B.Sc. (Computer Science)
CS 121 : ADVANCED 'C' PROGRAMMING
(CBCS 2019 Pattern) (Semester - II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Figures to the right indicate full marks.*
- 2) All questions are compulsory.*

Q1) Attempt any EIGHT of the following.

[8×1=8]

- a) What is the use of strcpy() function in C?
- b) Demonstrate puts () function.
- c) What is file opening mode.
- d) What is pointer variable? Give example.
- e) What is macro?
- f) What is the use of strncat () function.
- g) What is command line argument.
- h) Demonstrate type def keyword with example.
- i) What is string? Give example.
- j) Demonstrate “structure within structure” with example.

Q2) Attempt any FOUR of the following (Out of FIVE)

[4×2=8]

- a) Differentiate between static & dynamic memory allocation.
- b) Explain the file opening modes for text file.
- c) What is the use of # include directive.
- d) Explain the use of fgets() and fputs() with suitable example.
- e) Explain in brief concept of macros.

P.T.O.

Q3) Attempt any TWO of the following (Out of THREE) **[2×4=8]**

- a) Write a 'C' program to calculate area, & perimeter and diameter of circle using one function for all & use pointers.
- b) Write a 'C' program to accept a string & convert in uppercase without using built-in function.
- c) Write a 'C' program to accept a time from user as hh:mm:ss & check the validity of it. If it is invalid, validate it. Use pointer to structure.

Q4) Attempt any TWO of the following (Out of THREE) **[2×4=8]**

- a) Write a program in 'C' to accept details 'n' employees & print the details of highest salaried employee. Use structure to store the employee data.
- b) Differentiate macros and functions.
- c) Explain following functions with syntax and example.
fgetc(), fputc(), fscanf (), fprintf ().

Q5) Attempt any ONE of the following (Out of TWO) **[1×3=3]**

- a) What is the output of following code?

```
#include <stdio.h>

int main ()
{
    char str[100];
    char *ptr;
    strcpy(str, "India is GREAT");
    ptr = str + strlen (str)
    printf ("The string is:");
    while (*ptr != '\0')
    printf ("%c", *ptr --);
    return 0;
}
```

- b) Differentiate structure and union.



Total No. of Questions : 5]

SEAT No. :

P5130

[Total No. of Pages : 2

[5823]-202

First Year B.Sc. (Computer Science)
CS-122: Relational Database Management Systems
(2019 Pattern)(Semester II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Total number of questions are 5.*
- 2) *Total marks assigned 35.*
- 3) *Time assigned 2 hours.*

Q1) Attempt any Eight of the Following:

[8×1=8]

- a) What do you mean by trigger?
- b) State the different ways to call a PL/SQL function.
- c) What is the concurrent schedule?
- d) Define deadlock.
- e) What is audit trail?
- f) What do you mean by referential Integrity?
- g) What is the use of commit command?
- h) what is log?
- i) Define distributed database.
- j) Which are the types of NOSQL database?

Q2) Attempt any four of the following

[4×2=8]

- a) Explain types of cursor.
- b) Draw the state diagram of the transaction.
- c) Write down use and syntax of GRANT command.
- d) Which are the schemes of the recovery from concurrent transactions?
- e) Which are the characteristics of big data?

P.T.O.

Q3) Attempt any two of the following:

[2×4=8]

- a) Explain variations of two phase locking.
- b) Define transaction. Explain ACID properties of transaction.
- c) Explain mandatory access control method.

Q4) Attempt any two of the following:

[2×4=8]

- a) Write a plpgsql function that accepts student credit out of 10 marks and returns grade based on eligibility as -

If credit is less than 5 → C grade

If credit is less than 7 → B grade

If credit is above 7 → A grade

- b) Consider the following transaction. Give two non-serial Schedules that the serializable.

T1	T2
Read(X)	Read(Y)
X=X+5000	Y=Y+2000
Write(X)	Write(Y)
Read(Y)	Read(Z)
Y=Y-1500	Z=Z-3100
Write(Y)	Write(Z)

C) Explain encryption techniques used for database security.

Q5) Attempt any ONE of the following :

[1×3=3]

- a) Explain time stamp based protocol with read write conflicting conditions.
- b) Explain failure Classification



Total No. of Questions : 3]

SEAT No. :

P5131

[5823] - 203

[Total No. of Pages : 2

F.Y.B.Sc.

COMPUTER SCIENCE

Mathematics

MTC-121 : Linear Algebra

(2019 Pattern) (Semester -II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicates full marks.*
- 3) *Use of single memory, non-programmable scientific calculator is allowed.*

Q1) Attempt any five of the following.

[10]

- a) Define subspace of a vector space. Give one example of subspace of a vector space \mathbb{R}^2 .
- b) If $\vec{u} = (1, 2, -1)$ and $\vec{v} = (2, 0, 2)$ then find angle between \vec{u} and \vec{v} .
- c) Write the standard basis for $P_2(\mathbb{R})$. Also write it's dimension.
- d) Is the transformation $T : \mathbb{R}^2 \rightarrow \mathbb{R}^2$ defined by $T(x, y) = (2x, 1)$ is linear? Justify.
- e) Define the following terms:
 - i) Affine set
 - ii) Convex combination of Vectors
- f) Find the matrix of quadratic form given below:
$$Q(x) = 3x_1^2 + 2x_2^2 - 5x_3^2 - 6x_1x_2 + 3x_1x_3 - 4x_2x_3.$$
- g) Find the distance between vectors.

$$X = \begin{bmatrix} 10 \\ -3 \end{bmatrix} \text{ and } Y = \begin{bmatrix} -1 \\ -5 \end{bmatrix}.$$

P.T.O.

Q2) Attempt any three of the following. **[15]**

- a) If W_1 and W_2 are subspaces of a vector space Y , then prove that $W_1 \cap W_2$ is a subspace of V . Is $W_1 \cup W_2$ is a subspace of V ? Justify.
- b) Find rank of following matrix A and hence write it's nullity.

$$A = \begin{bmatrix} 1 & 1 & 0 & -1 \\ 1 & 2 & 3 & 0 \\ 2 & 3 & 3 & -1 \end{bmatrix}.$$

- c) Find all eigenvalues of the following matrix A & hence state whether it is diagonalizable.

$$A = \begin{bmatrix} -1 & 4 & -2 \\ -3 & 4 & 0 \\ -3 & 1 & 3 \end{bmatrix}.$$

- d) Determine whether $S = \{\bar{u}_1, \bar{u}_2, \bar{u}_3\}$ is a basis for \mathbb{R}^3 where $\bar{u}_1 = (2, -1, 3)$, $\bar{u}_2 = (4, 1, 3)$ $\bar{u}_3 = (8, -1, 8)$.
- e) Classify the quadratic form given below $Q(x) = 4x_1^2 - 4x_1x_2 + 4x_2^2$.

Q3) Attempt any one of the following. **[10]**

- a) Check whether the following matrix is diagonalizable. If yes find the matrix P that diagonalizes A .

$$A = \begin{bmatrix} 2 & 1 \\ 2 & 3 \end{bmatrix}.$$

- b) i) Express $P = 1 + 2x - x^2$ as a linear combination of $P_1 = 1+x$, $P_2 = 1-x$ and $P_3 = x^2$.
- ii) Define orthonormal set. Determine whether the given set $S = \{\bar{u}_1, \bar{u}_2, \bar{u}_3\}$ is orthonormal or not, where.

$$\bar{u}_1 = \begin{bmatrix} 1/\sqrt{10} \\ 3/\sqrt{20} \\ 3/\sqrt{20} \end{bmatrix} \quad \bar{u}_2 = \begin{bmatrix} 3/\sqrt{10} \\ -1/\sqrt{20} \\ -1/\sqrt{20} \end{bmatrix} \quad \bar{u}_3 = \begin{bmatrix} 0 \\ -1/\sqrt{2} \\ 1/\sqrt{2} \end{bmatrix}$$



Total No. of Questions : 3]

SEAT No. :

[Total No. of Pages : 3

P5132

[5823]-204

F.Y.B.Sc. (Computer Science)

MATHEMATICS

MTC-122 : Graph Theory

(2019 Pattern) (Semester-II) (Paper-II)

Time : 2 Hours]

[Max. Marks : 35

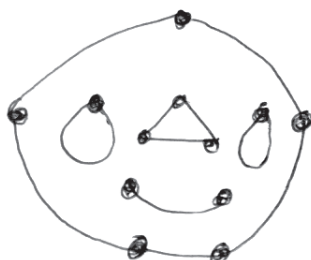
Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.

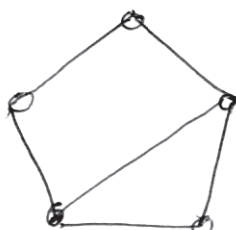
Q1) Attempt any five of the following

[10]

- a) Draw K_6 , the complete graph on 6 vertices.
- b) Define regular graph. Also draw one example of a 2-regular graph.
- c) What is the number of connected components in the following graph?

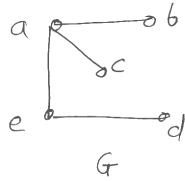


- d) Determine whether the following graph is a bipartite graph. Justify.



P.T.O.

- e) Draw the complementary graph \bar{G} of the following graph G .

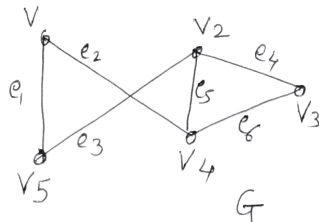


- f) How many edges are there in a regular graph of degree 3 with 6 vertices?
 g) Define : Tree. Draw an example of a tree.

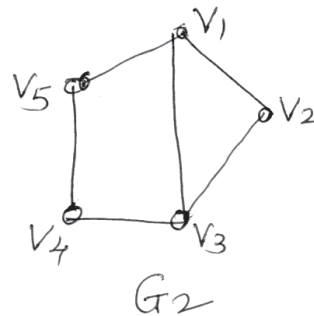
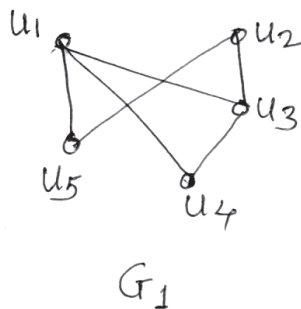
Q2) Attempt any three of the following.

[15]

- a) Write the adjacency matrix and incidence matrix for the following graph G .



- b) Show that the following graphs G_1 and G_2 are isomorphic.

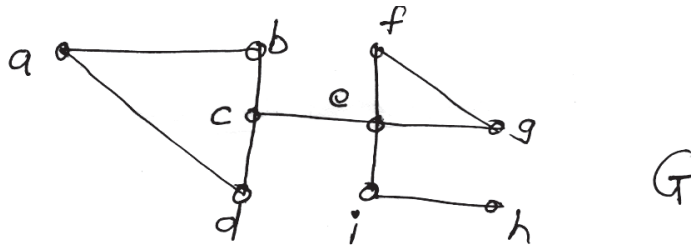


- c) Draw 10 nonisomorphic simple graphs with 4 vertices.
 d) Give an example of a graph which has-
 i) Euler circuit but not Hamilton circuit.
 ii) Euler circuit as well as Hamilton circuit.
 e) Construct a complete binary tree of height 4. How many leafs it has?

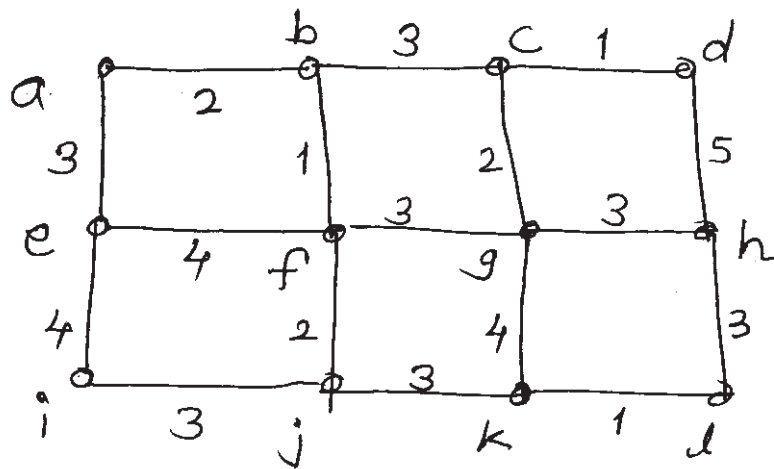
Q3) Attempt any one of the following.

[10]

- a) For the given graph G answer the following questions



- ii) List all cutvertices in G .
 - iii) List all cycles in G .
 - iv) List any two distinct paths from the vertex a to vertex h in G .
 - v) Verify Handshaking lemma for this graph.
- b) i) Explain the “seven bridges problem of Königsberg”.
- ii) Use Kruskal’s algorithm to find a minimum spanning tree in the following weighted graph given below.



Total No. of Questions : 5]

SEAT No. :

P5133

[Total No. of Pages : 2

[5823]-205

F.Y.B.Sc. (Computer Science)

ELECTRONIC SCIENCE

ELC - 121 : Instrumentation Systems

(Semester - II) (New CBCS 2019 Pattern) (Paper - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Figures to the right indicate full marks.*
- 4) *Draw neat diagrams wherever necessary.*
- 5) *Questions 2 to 5 carry equal marks.*

Q1) Solve any five of the following.

[5×1=5]

- a) Define actuator with one example.
- b) State any two applications of PIR sensor.
- c) Draw the circuit diagram for unity gain amplifier using opamp.
- d) Calculate the output voltage of LM35 for 45°C temperature.
- e) Which are two types of film sensors?
- f) Draw the symbol of OPAMP and label it.

Q2) a) Attempt any two of the following.

[2×3=6]

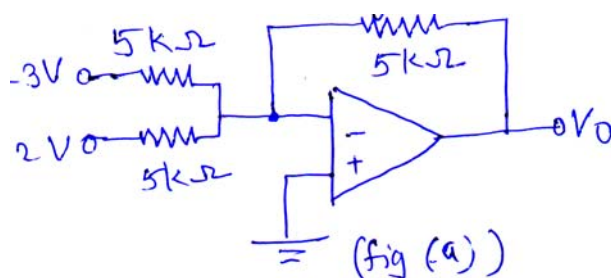
- i) Describe block diagram of instrumentation system.
 - ii) Describe working of CCD image sensor.
 - iii) Draw smart instrumentation system. Give two advantages.
- b) Draw circuit diagram of op-amp based voltage to current converter and explain its working.

[1×4=4]

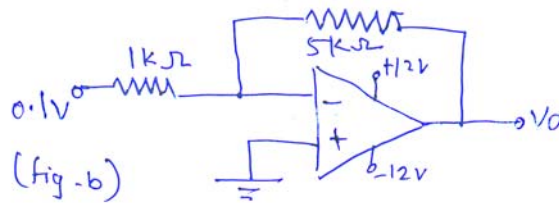
Q3) a) Attempt any two of the following.

[2×3=6]

- i) Explain working principle of ultrasonic sensor and state any two applications.
 - ii) Explain the concept of nano sensor.
 - iii) Explain the working of PIR sensor.
- b) Identify the following configurations and find their output voltage. [1×4=4]



P.T.O.



Q4) a) Attempt any two of the following. **[2×3=6]**

- i) Discuss the concept of active and passive sensors with example.
- ii) Draw the circuit diagram of non-inverting amplifier for op-amp. Derive the expression for its output voltage.
- iii) Explain op-amp as comparator.

b) Explain construction and working of DC motor. **[1×4=4]**

Q5) Attempt any four of the following. **[4×2.5=10]**

- a) Define the following term for sensor.
 - i) Resolution.
 - ii) Linearity.
- b) Explain working principle of tilt sensor.
- c) List any five features of LM35 temperature sensor.
- d) Draw the block diagram of op-amp. State ideal value of input offset voltage.
- e) State any five advantages of smart sensor.
- f) Explain the concept of virtual ground with neat diagram.



Total No. of Questions : 5]

SEAT No. :

P5134

[5823] - 206

[Total No. of Pages : 2

F.Y.B.Sc. (Computer Science)

ELECTRONIC SCIENCE

ELC-122 : Basics of Computer Organization

(New 2019 Pattern) (CBCS) (Semester -II) (Paper-II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q2 to Q5.*
- 3) *Figures to the right indicate full marks.*
- 4) *Draw neat diagrams wherever necessary.*
- 5) *Questions 2 to 5 carry equal marks.*

Q1) Solve any five of following.

[5×1=5]

- a) _____ number of address lines are required for the memory of 2 MB capacity.
- b) Write the full forms with respect to Computer Organization.
CPU - _____
PC-_____
- c) What is the role of stack pointer in Computer Organization?
- d) Write any two applications of counter.
- e) Draw the logic symbol of J-K flip-flop
- f) What is significance of data bus in Computer Organization?

Q2) a) Answer any two of the following.

[2×3=6]

- i) Draw the neat logic diagram of R-S flip flop using NAND gates. Also write down its truth table.
 - ii) Explain the need of Input output interface in Computer Organization.
 - iii) Write three point difference between Synchronous Counter and Asynchronous counter.
- b) With neat block diagram explain four level memory hierarchy. **[4]**

P.T.O.

- Q3) a)** Answer any two of the following ; **[2×3=6]**
- i) Design a memory of (1K×16) using available memory chip of size (1K×4). The memory is of RAM type.
 - ii) Explain T Flip-Flop using J-K Flip-Flop with neat logic diagram. Draw the wave forms of clock and output.
 - iii) Draw logic diagram of 3 bit SISO shift register in right shift mode and explain its working.
- b) Draw neat block diagram of CPU and Explain working of each block.**[4]**

- Q4) a)** Answer any Two of the following. **[2×3=6]**
- i) Explain the operation of ring counter with neat logic diagram.
 - ii) Explain the concept of memory stack organization with diagram.
 - iii) Discuss various types of memories used in computer system in short.
- b) Explain working of 3-bit Asynchronous up counter with logic diagram, Truth table and timing diagram. **[4]**

- Q5)** Answer any four of the following. **[10]**
- a) Explain in short Race around condition in J-K Flip Flop
 - b) Draw logic diagram of PISO shift register.
 - c) What is role of Cache memory in computer organization.
 - d) Write a short note on Virtual memory.
 - e) Explain basic Computer Organization with block diagram.
 - f) Calculate average Access time of memory if hit ratio is 95%, Cache memory access time is 400 nsec and main memory access time is 900 nsec.



Total No. of Questions : 5]

SEAT No. :

P5135

[5823]-207

[Total No. of Pages : 2

First Year B.Sc. (Computer Science)
STATISTICS
CSST-121 : METHODS OF APPLIED STATISTICS
(2019 Pattern) (Semester -II) (Paper-I)

Time :2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator and statistical tables is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

Q1) Choose the most appropriate alternative for each of the following: **[1 each]**

- i) The diagram which visualizes the correlation between two variables is.
 - a) Scatter diagram
 - b) Histogram
 - c) Bar diagram
 - d) Pie diagram
- ii) The number of normal equations required to fit the curve $Y=ab^x$ are
 - a) Four
 - b) Two
 - c) One
 - d) Three
- iii) Partial correlation coefficient $r_{12.3}$ is the simple correlation between
 - a) X_1 and X_2
 - b) X_1 and X_2 when linear effect of X_3 is eliminated from each of them.
 - c) X_1 and X_3
 - d) X_1 and X_3 when linear effect of X_2 is eliminated from each of them.
- iv) In time series the data are arranged in
 - a) Chronological order
 - b) Geographical order
 - c) Alphabetical order
 - d) Numerical order

Q2) Attempt any five of the following;

[2 each]

- a) Define bivariate data with one example.
- b) State the types of correlation giving one illustration each.
- c) Define Karl Pearson's coefficient of correlation.
- d) Explain the term regression.

P.T.O.

- e) If $b_{XY}=0.4$, $b_{YX}=1.6$, then find $r(X,Y)$.
- f) Define coefficient of determination. And state its interpretation.
- g) Define multiple correlation coefficient for a trivariate data.
- h) State the additive and multiplicative models of time series.

Q3) Attempt any two of the following:

[4 each]

- a) Six entries at a song competition were rated by two judges X and Y as follows.

Ranks by X	5	6	4	3	2	1
Ranks by Y	6	2	1	3	4	5

Compute Spearman's rank correlation coefficient between X and Y.

- b) For a trivariate data: $r_{12}=0.6$, $r_{13}=0.4$, if $R_{1.23}=1$, find the value of r_{23} .
- c) What is time series? Explain 'Trend' as a component of time series.

Q4) Attempt any Two of the following

[4 each]

- a) In the regression analysis the equation of two lines of regression are $2X+3Y=8$ and $X+2Y=5$, find mean values of X and Y.
also, define the following terms: Covariance, regression coefficient of Y on X.
- b) Explain the concept of multiple regression, Also, state the equation of multiple regression plane of X_1 and X_2 and X_3 .
- c) Describe the stepwise procedure of fitting the curve of the type $Y=a+bX+cX^2$ to the bivariate data using the method of least squares.

Q5) Attempt any one of the following:

[5each]

- a) Describe the stepwise procedure of fitting a line of regression of Y on X to the bivariate data using method of least squares.
- b) Fit a straight line trend by the method of least squares to the following data:

Year	2015	2016	2017	2018	2019
Production (in tonnes)	14	11	13	15	16



Total No. of Questions : 4]

SEAT No. :

P5136

[Total No. of Pages : 2

[5823]-208

First Year B.Sc. (Computer Science)

STATISTICS

CSST - 122 : Continuous Probability Distributions and Testing of Hypothesis

(2019 Pattern) (Semester - II) (Paper- II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of non-programmable scientific calculator is allowed.*
- 4) *Use of statistical tables is allowed.*
- 5) *Symbols have their usual meaning unless otherwise stated.*

Q1) Answer EACH of the following by selecting most appropriate option.

[1 mark each]

- a) IF $X \sim U(3, 8)$ then $F(5)$ is
 - i) $1/5$
 - ii) $3/5$
 - iii) $2/5$
 - iv) 1
- b) A random variable X has an exponential distribution with mean 5. Then variance of X is
 - i) 2.5
 - ii) 5
 - iii) 25
 - iv) 0
- c) A random variable X has Pareto distribution with $\alpha = 3$, then mean of X is
 - i) 3
 - ii) 9
 - iii) 1.5
 - iv) 0.75
- d) The probability of rejecting H_0 when it is true is called as
 - i) type I error
 - ii) Type II error
 - iii) level of significance
 - iv) standard error
- e) In a test of hypothesis problem, the sample size is 57, then this test is called as
 - i) small sample test
 - ii) small population test
 - iii) large sample test
 - iv) large population test

P.T.O.

Q2) Answer any TWO of the following: [5]

- a) Define exponential distribution with mean = 0. State its lack of memory property and give one example of this property.
- b) Describe procedure of testing mean of a population when sample size is large.
- c) Let X follows normal distribution with mean 2 and variance 16. If $Y = (3X + 2)$, find
 - i) $P(Y > 8)$ and
 - ii) $P(6 < Y < 9)$.

Q3) Answer any TWO of the following: [5]

- a) Describe procedure of drawing a sample of size n from $N(\mu, \sigma^2)$ using Box-Muller transformation.
- b) Define normal distribution. State any three properties of normal distribution.
- c) In a sample of 7 observations, the sum of squared deviations from the mean is 94.5. In another sample of 10 observations, the sum of squared deviations from the mean is 101.7. Test whether the two variances are significantly different at 10% level of significance.

Q4) Answer any ONE of the following.

- a) i) Define each of the following. [5]
 - Parameter
 - Statistic
 - Null hypothesis
 - Alternate hypothesis
 - Type II error
- ii) Theory predicts that the proportion of beans in 3 groups A, B and C should be in the ratio 1 : 2 : 3. In an experiment on 300 beans, the frequencies in the 3 groups were 45, 105 and 150 respectively. Does the experiment support the theory at 5% level of significance? Justify your answer. [5]
- b) i) Describe procedure of paired - t test. [5]
- ii) A certain factory runs in two shifts. A sample of 100 articles selected from production of day shift gave 52 defective articles whereas a sample of 700 articles selected from production of night shift gave 45 defective articles. Can we conclude that proportion of defective articles in the day shift is significantly less than that of night shift at 5% level significance? [5]