

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], & arr[1]);
    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

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 : $a_r - a_{r-1} - 12 a_{r-2} = 0, \quad a_0 = 0, a_1 = 1$. **[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]

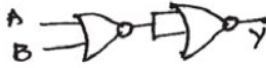
[Max. Marks : 35

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]

- a) Write a short note on Hexadecimal number system.
- b) Write a short note on universal gates.
- c) Write a short note on IC 74138.
- d) What is a Gray code? Where is it used?
- e) Explain how EX-OR gates can be used as controlled inverter.
- f) 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]
- $$f(x) = k(4x - 2x^2), \quad 0 \leq x \leq 2$$
- $$= 0, \quad \text{otherwise}$$
- 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]

