USN : ______________________ Course Code : 18DMATCS51/18DMATIS51

Fifth Semester B.E Semester End Examination, JANUARY_MARCH_2021

NUMERICAL METHODS AND PROBABILITY

Time: 3 hrs Max. Marks :100

Instructions :1. Answer FIVE full Questions selecting at least ONE Question from Each Unit.

MODULE 1

L CO PO M

1a. Using Newtons forward interpolation formula compute y(9) from the following data.

x	8	10	12	14	16
y	10	19	32	54	89

[1] [1] [1] [6]

1b. Use Lagrange's interpolation formula to compute y(1) from the following data.

x	-1	0	2	3
y	-8	3	1	2

[1] [1] [1] [7]

1c. Evaluate $\int_0^1 \frac{1}{1+x^2}$ using Simpson's 1/3rd rule and Simpson's 1/3rd rule by taking n=10.

[1] [2] [1] [7]

OR

2a. Estimate the number of students who secured marks between 40 and 45 from the following table:

Marks	30-40	40-50	50-60	60-70	70-80
No. od Students	31	42	51	35	31

[2] [1] [1] [6]

2b. Compute the value of f(2.5) using Newton's divided difference interpolation formula using the following table.

x	-3	-1	0	3	5
f(x)	-30	-22	-12	330	3458

[1] [1] [1] [7]

2c. Find the area bounded by the curve y=f(x) using Simpson's 1/3rd rule and Weddle's rule using the following table.

x	1	2	3	4	5	6	7
y	2.157	3.519	4.198	4.539	4.708	4.792	4.835

[1] [2] [1] [7]

MODULE 2

3a. If A and B are independent then prove that,

(a) $\overline{A}$ and B are independent.

(b) $\overline{A}$ and $\overline{B}$ are independent.

[1] [3] [1] [6]

3b. The probabaility that a contractor gets a plumbing contract is 2/3. The probability that he may not get electrical contract is 5/9. If the probability of getting atleast one contract is 4/5, then what is the probability that he will get both contract?

[2] [3] [1] [7]

3c. In a bolt factory there are 4 machines A, B, C and D manufacturing respectively 20%, 15%, 25% and 40% of the production.Out of these 5%, 4%, 3% and 2% respectively are defective. A bolt is drawn at a random from the production and is found to be defective. Find the probobaility that it is manufacture by A and D. [1] [3] [1] [7]

OR

4a. State and Prove Baye's theorem. [1] [3] [1] [6]

4b. There are 6 positive and 8 negative numbers. Four numbers are drwan randomly and multiplied. What is the probability that product is positive number. [2] [3] [1] [7]

4c. If A and B are any two events with P(A)=1/2, P(B)=1/3 and $P(A \cap B) = 1/4$. Then evaluate P(A/B), P(B/A), $P(\frac{\bar{A}}{\bar{B}})$. [2] [3] [1] [7]

MODULE 3

5a. A random variable X has the following probabaility function:

x	0	1	2	3	4	5	6	7
p(x)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

(i) Find the vlaue of k.
(ii) Evaluate $P(x < 6)$, $P(x \geq 6)$, and $P(0 < x < 5)$. [1] [4] [1] [6]

5b. Derive mean and variance of Binomial distribution. [1] [4] [1] [7]

5c. In a test on 2000 electric bulbs, it was found that the life of a particular make, was normally distributed with an average life of 2040 hours and S. D. of 60 hours. Estimate the number of bulbs likely to burn for
(a) more than 2150 hours, (b) less than 1950 hours, and (c) more than 1920 hours and but less than 2160 hours. [1] [4] [1] [7]

OR

6a. The probability that a pen manufactured by a company will be defective is 1/10. If 12 such pens are manufactured, find the probability that (a) exactly two will be defective (b) at least two will be defective and (c) none will be defective. [1] [4] [1] [6]

6b. A random variable x has the following density function

$$f(x) = \begin{cases} kx^2 & -3 \leq x \leq 3 \\ 0 & otherwise \end{cases}$$

Find the value of k. Hence determine mean and standard deviation of it. [1] [4] [1] [7]

6c. In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and S. D. of the distribution. [1] [4] [1] [7]

MODULE 4

7a. If X and Y are independent, then prove that
(a) E(XY) = E(X)E(Y).
(b) Var(X+Y) = Var(X)+Var(Y). [1] [5] [1] [6]

7b. Two cards are selected at a random from a box which contains five cards numbered 1, 1, 2, 2 and 3. Find the joint distribution of X and Y where X denotes the sum and Y denotes maximum of the two numbers drawn. Also find Cov(X, Y). [1] [5] [1] [7]

7c. Evaluate the conditional distributions $h(x|1)$ for the following joint distribution. Show that X and Y are not independent.

Y X	1	2	3
1	1/12	1/6	0
2	0	1/9	1/5
3	1/18	1/4	2/15

[1] [5] [1] [7]

OR

8a. Find the joint distribution of X and Y, which are independent random variables with the following respective distributions.

x	1	2
f(x)	0.7	0.3

y	-2	5	8
g(y)	0.3	0.5	0.2

Show that Cov(X,Y) = 0.

[1] [5] [1] [6]

8b. A fair coin is tossed three times. Let X denote 0 or 1 according as a head or a tail occurs on the first toss. Let Y denote the number of tails which occur. (a) Find the marginal distributionsof X and Y, (b) Find Cov(X,Y).

[1] [5] [1] [7]

8c. Two marbles are selected at random from a box containing 3 blue, 2 red and 3 green marbles. If X is the number of blue marbles and Y is the number of red marbles selectedFind the Joint probability distribution of X and Y. Also evaluate E(XY).

[1] [5] [1] [7]

MODULE 5

9a. A salesman sells an article in three cities A, B, and C. He never sells in the same city on successive days. If he sells in city A on a day, next day he sells in city B. If he sells in either B or C then next day he is twice as lkely to sell in city A compared to other city. Find the transition of this Markov chain. In long how often he will visit city A, B and C.

[1] [1] [1] [6]

9b. Every year a man trades his car for a new car. If he has a Maruti, he trades it for an Ambassador. If he has an Ambassador, he trades it for a Santro. However, if he has a Santro, he is just as likely to trade it for a new Santro as to trade it for a Maruti or an Ambassador. In 2000 he bought his first car was Ambassador. Find the probability that he has Santro car in the year 2003. In long run, how often will he have a Santro.

[1] [6] [1] [7]

9c. Suppose an urn A contains 2 white marbles and urn B contains 4 red marbles. At each step of the process, a marble is selected at random from each urn and two marbles selected are interchanged. Find the transition matrix P. What is the probabaility that there are 2 red marbles in urn A after three steps.

[1] [6] [1] [7]

OR

10a. Find the fixed probability vector of the regular stochastic matrix $P = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1/2 & 1/2 & 0 \end{bmatrix}$. and also verify that is it a regular matrix or not?

[1] [6] [1] [6]

10b. Three boys A, B, and C are throwing a ball to each other randomly. A always throws to B and B always throws to C as likely to throw to B as to A. They never throw to themselves. Find the prabailities (i) A has a ball on third throw.
(ii) B ahs a ball on fourth throw.
(iii) In long run how often they have a ball.

[1] [6] [1] [7]

10c. A students study habits are as follows. If he studies on one night he is 60% sure not to study the next night. If he does not study one night he is 80% sure to study the next day. Find the transition matrix of the markov chian prpocess. In the long run how often does he study?

[1] [6] [1] [7]

2 to 5 LIBRARY - 17-8-19

USN | | | | | | | | | | |

16DIPMATC51

Fifth Semester B.E. Fast Track Semester End Examination, July/August 2019

NUMERICAL METHODS AND PROBABILITY

Time: 3 Hours **Max. Marks: 100**

Instructions:
1. *Unit-IV and Unit-V are compulsory.*
2. *Answer any one full question from remaining each unit.*
3. *Use of statistical table will be permitted.*

UNIT – I

L CO PO M

1 a. Find the cubic polynomial which takes the following values:

x	0	1	2	3
$f(x)$	1	2	1	10

(1) (1) (1) (06)

b. Use Langrange's interpolation formula to find the value of $f(5)$ for the following data:

x	0	2	3	6
y	648	704	729	792

(2) (1) (1) (07)

c. Evaluate $\int_4^{5.2} \log_e x\, dx$, using Simpson's 3/8th rule by taking six sub-intervals.

(2) (2) (1) (07)

OR

2 a. The area A of a circle of diameter d is given as follows:

d	80	85	90	95	100
A	5026	5674	6362	7088	7854

Calculate the area of a circle of diameter 105.

(2) (1) (1) (06)

b. Use Newton's divided difference interpolation method to compute $f(5.5)$ from the following table:

x	0	1	4	5	6
$f(x)$	1	14	15	6	3

(1) (1) (1) (07)

c. Evaluate $\int_0^1 \frac{dx}{1+x}$, using Trapezoidal rule by taking $h = 0.25$.

(2) (2) (1) (07)

UNIT – II

L CO PO M

3 a. When a coin is tossed four times, find the probability of getting (i) one head (ii) at most three heads and (iii) at least two heads.

(2) (3) (1) (06)

b. Let A and B be any two events with $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{3}$ and $P(A \cup B) = \frac{1}{2}$. Then evaluate $P(A|B)$, $P(B|A)$ and $P(A \cap B')$.

(1) (3) (1) (07)

c. In a certain college, 4% of the boys and 1% of girls are taller than 1.8 m. Furthermore 60% of the students are girls. If a student is selected at random and is found to be taller than 1.8 m, what is the probability that the student is a girl?

(2) (3) (1) (07)

Note: L (Level), CO (Course Outcome), PO (Programme Outcome), M (Marks)

OR

4 a. Two cards are drawn in succession from a pack of 52 cards. Find the chance that the first is a king and second a queen, if the first card is (i) replaced (ii) not replaced.

(2) (3) (1) (06)

b. Let A and B be any two events with $P(A)=\frac{1}{2}$, $P(B)=\frac{1}{3}$ and $P(A\cap B)=\frac{1}{4}$. Then find $P(A|B)$, $P(A\cup B)$ and $P(A'|B')$.

(1) (3) (1) (07)

c. The chance that a doctor will diagnose the disease correctly 60%. The chance that a patient will die after correct diagnose is 40% and chance death by wrong diagnosis is 70%. If a patient will die, what is the chance that his disease was correctly diagnosed?

(2) (3) (1) (07)

UNIT - III

L CO PO M

5 a. A die is tossed thrice. A success is "getting1 or 6" on a toss. Find the mean and variance of the number of successes.

(2) (4) (1) (06)

b. Determine the Bionomial distribution for which mean=2 and mean+variance=3.

(1) (4) (1) (07)

c. If x a normal variate with mean 30 and standard deviation 5, then find the probability that $26 \le x \le 40$.

(2) (4) (1) (07)

OR

6 a. Let $f(x)$ be the probability density function defined as follows

$$f(x)=\begin{cases} e^{-x}, & if\ x\ge 0 \\ 0, & if\ x<0. \end{cases}$$

Then determine (i) the probability that the variate having this density will fall in the interval (1, 2) and (ii) the cumulative probability function $F(2)$.

(2) (4) (1) (06)

b. If a random variable has a Poisson distribution, such that $P(1)=P(2)$, then find mean of the distribution and $P(4)$.

(1) (4) (1) (07)

c. Find the mean and variance of the exponential distribution of $f(x)=\frac{1}{b}e^{-\frac{(x-a)}{b}}, x>a$.

(2) (4) (1) (07)

UNIT - IV (Compulsory)

L CO PO M

7 a. Given joint probability distribution of two random variables X and Y, find *(i)* the marginal distribution of X *(ii) cov(X,Y)*.

X \ Y	-3	2	4
1	0.1	0.2	0.2
3	0.3	0.1	0.1

(2) (5) (1) (06)

Note: L (Level), CO (Course Outcome), PO (Programme Outcome), M (Marks)

b. Find the joint distribution of X and Y which are independent random variables with the following marginal distributions:

x_i	1	2
$f(x_i)$	0.6	0.4

y_j	5	10	15
$g(y_j)$	0.2	0.5	0.3

Also find $\rho(X,Y)$.

(1) (5) (1) (07)

c. A coin is tossed three times. Let $X=0$ or $X=1$ according as tail or head occurring on the first toss and Y is the number of tails. Determine
(i) marginal distribution of X, *(ii)* marginal distribution of Y, *(ii)* joint PDF of " X and Y ".

(2) (5) (1) (07)

UNIT –V (Compulsory)

L CO PO M

8

a. Find the unique fixed probability vector of $A=\begin{bmatrix} 0 & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{3} & \frac{2}{3} & 0 \\ 0 & 1 & 0 \end{bmatrix}$.

(1) (6) (1) (06)

b. A man's smoking habits are as follows. If he smokes filter cigarette one week, he switches to non filter cigarettes the next week with the probability 0.2. On the other hand if he smokes non filter cigarette one week, there is a probability 0.7 that he will smoke non filter cigarettes the next week as well. In a long run how often he smoke filter cigarette?

(2) (6) (1) (07)

c. Three boys A, B and C are throwing a ball to each other randomly. A always throws to B and B always to C and C is as likely to throw B as to A. They never throw to themselves. Find the probabilities (i) A has (ii) B has and (iii) C has the ball on fourth throw.

(2) (6) (1) (07)

Library 07/01/20
9.30-12.30

N | | | | | | | | | | |

16DIPMATC51

Fifth Semester B.E. Makeup Examination, January 2020
NUMERICAL METHODS AND PROBABILITY

ne: 3 Hours   Max. Marks: 100

Instructions: 1. *Answer any one full question from each unit.*
2. *Use of Statistical table will be permitted.*

UNIT - I

L CO PO M

a. From the following table, estimate the number of students who obtained marks between 76 and 80.

Marks	36-45	46-55	56-65	66-75	76-85
No. Of Students	18	40	64	50	28

(1) (1) (1) (06)

b. Find the interpolating polynomial using Newton's divided difference using following data

X	0	2	3	6
f(x)	-4	2	14	158

(2) (1) (1) (07)

c. Using (i) Simpson's 1/3rd method (iii) Simpson's 3/8th method evaluate $\int_1^{\pi} e^{\sin\theta} d\theta$, dividing the interval into 6 equal parts.

(1) (1) (1) (07)

OR

a. Using Newton's forward interpolation formula find f(1.5) for the function given by the following data:

X	0	1	2	3
f(x)	1	5	8	14

(1) (1) (1) (06)

b. Use Lagrange's formula to find $f(6)$, given that

X	3	7	9	10
f(x)	168	120	72	63

(1) (1) (1) (07)

c. Using (i) Simpson's 1/3rd method and (ii) Weddle's rule evaluate $\int_0^3 \frac{1}{1+x^2} dx.$ by taking 7 ordinates.

(1) (1) (1) (07)

UNIT – II

L CO PO M

3 a. State and prove Baye's theorem

(1) (2) (1) (06)

b. A bag contains 40 tickets numbered 1,2,3, ... , 40 of which four are drawn at random and arranged in ascending order such that $t_1 < t_2 < t_3 < t_4$. Find the probability of t_3 being 25.

(1) (2) (1) (07)

c. The students in a class are selected at random, one after the other for an examination. Find the probability that boys and girls in a class alternate if (i) the class consists of 4 boys and 3 girls and (ii) the class consists of 3 boys and 3 girls.

(2) (2) (1) (07)

OR

4 a. A dice is tossed twice, find the probability scoring 7 points (i) ones (ii) at least once and (iii) twice.

(1) (2) (1) (06)

b. In a bolt factory machines A, B, C and D manufactured 25%, 15%, 25% and 40% of the total of their output. 5%, 4%, 3% and 2% are defective bolts respectively.. A bolt is drawn at random from the product and it is found to be defective. What are the probabilities that it was manufactured by machine A or D.?

(2) (2) (1) (07)

Note: L (Level), CO (Course Outcome), PO (Programme Outcome), M (Marks)

c. In a school 25% of the students failed in first language, 15% of the students failed in second language and 10% of the students failed in both. If a student is selected at random find the probability that

(i) He failed in first language if he had failed in the second language.
(ii) He failed in second language if he had failed in the first language
(iii) He failed in either of the two languages.

(2) L (2) CO (1) PO (07) M

UNIT - III

5 a. A random variable X has the following probability function:

x	-2	-1	0	1	2	3
P(x)	0.1	k	0.2	2k	0.3	k

Find the value of k and calculate mean and variance.

(1) (3) (1) (06)

b. In a certain factory turning out razor blades there is a small chance 0.002 for any blade to be defective. The blades are supplied in packets of 10. Use Poisson's distribution to calculate the approximate number of packets containing no defective, one defective and 2 defective blades respectively in a consignment of 10,000 packets.

(2) (3) (1) (07)

c. In a test on 2000 electric bulbs, it was found that the life of a particular bulb was normally distributed with an average life of 2040 hrs and S. D. of 60 hrs. Estimate the number of bulbs lik to be burn for

(i) More than 2150 hrs.
(ii) Less than 1950 hrs.

(2) (3) (1) (07)

OR

6 a. Derive mean and variance of binomial distribution.

(1) (3) (1) (06)

b. A random variable gives the measurements x between 0 and 1 with a probability function

$$f(x)=\begin{cases}2x+3, 0\le x\le 1\\ 0, otherwise\end{cases}$$

(i) Find $p(x\le 1/2)$
(ii) Find $p(x>1/2)$
(iii) Find k such that $p(x\le k)=1/2$.

(2) (3) (1) (07)

c. Find the mean and variance of the exponential distribution of $f(x)=\frac{1}{b}e^{-(x-a)/b}, x>a.$

(1) (3) (1) (07)

OR

7 a. If X and Y are independent random variables, then prove that

(i) $E(XY)=E(X)E(Y)$
(ii) $Var(X+Y)=Var(X)+Var(Y)$
(iii) $Cov(X,Y)=0.$

(1) (4) (1) (06)

b. Determine (i) marginal distribution of X and Y (ii) $Cov(X,V)$ and (iii) $\rho(X,Y)$ for the following JPD

X \ Y	-3	2	4
1	0.1	0.2	0.2
3	0.3	0.1	0.1

(1) (4) (1) (07)

Note: L (Level), CO (Course Outcome), PO (Programme Outcome), M (Marks)

c. Evaluate conditional distributions $h(x/1)$ for the following joint distribution. Show that X and Y are not independent.

X \ Y	1	2	3
1	1/12	1/6	0
2	0	1/9	1/5
3	1/18	1/4	2/15

(2) (4) (1) (07)

OR

8 a. If X and Y are independent random variables, then find the joint distribution of X and Y with the following marginal distribution of X and Y.

X	1	2
P(x)	0.6	0.4

Y	5	10	15
P(y)	0.2	0.5	0.3

(1) (4) (1) (06)

b. A fair coin is tossed three times. Let X denotes 0 or 1 according as tail or head occurring on the first toss and Y is the number of tails. Determine (i) marginal distribution of X and Y (ii) Joint PDF of X and Y (iii) Expectation of X and Y.

(1) (4) (1) (07)

c. Determine (i) marginal distribution of X and Y (ii) Find the conditional probability $h(x/y=1)$ where

X \ Y	0	1	2
0	0.1	0.4	0.1
1	0.2	0.2	0

(7) (4) (1) (07)

L CO PO M

UNIT -V

9 a. Find the unique fixed probability vector of $P=\begin{bmatrix} 0 & 3/4 & 1/4 \\ 1/2 & 1/2 & 0 \\ 0 & 1 & 0 \end{bmatrix}$

(1) (5) (1) (06)

b. A students study habits are as follows. If he studies one night he is 60% sure not to study the next night. If he does not study one night he is 80% sure to study the next day. In the long run how often does he study?.

(1) (5) (1) (07)

c. A man smoking habits are as follows. If he smokes filter cigarettes one week, he switches to non filter cigarettes next week with probability 0.2. On the other hand if he smokes non filter cigarettes one week there is probability of 0.7 that he will smoke non filter cigarettes the next week as well. In the long run how often does he smoke filter cigarettes?

(2) (5) (1) (07)

OR

10 a. Define the following:

(i) Unique fixed probability vector.
(ii) Regular Stochastic Matrix.
(iii) Markov Chain.

(1) (5) (1) (06)

Note: L (Level), CO (Course Outcome), PO (Programme Outcome), M (Marks)

b. Find the unique fixed probability vector of $P = \begin{bmatrix} 0 & 1 & 0 \\ 1/2 & 0 & 1/2 \\ 1/2 & 1/4 & 1/4 \end{bmatrix}$

(1) (5) (1) (07)

c. Three boys A, B, C are throwing a ball to each other randomly. A always throws to B and B always throws to C. C as likely to throw to B as to A. They never throw to themselves. Initially C has the ball. After 3 throws find the probability that

(i) A has the ball.

(ii) B has the ball.

(iii) C has the ball.

(2) (5) (1) (07)

4th Sem Civil, Mech, IP, AE, E&E, E&C & CS

USN : ____________________

Course Code : 16DIPMATC51

Semester B.E FASTTRACK Examination, OCTOBER_NOVEMBER_2020

NUMERICAL METHODS AND PROBABILITY

Time: 3 hrs

Max. Marks :100

Instructions :1. Answer any Five full Questions selecting at least One Full Question from Each Unit. 2. Each Question carry Equal Marks. 3. Missing Data may be suitably assumed.

MODULE 1

L CO PO M

1a. Evaluate the values of y(168) and y(410) where y denotes the distances in nautical miles of the visible horizon height x in feet above the earth' surface.

X(height)	100	150	200	250	300	350	400
Y(distance)	10.63	13.03	15.04	16.81	18.42	19.90	21.27

[2] [1] [1] [6]

1b. Find the polynomial by Lagrange formula and hence find f(3)

x	0	1	2	5
y	2	3	12	147

[2] [1] [1] [7]

1c. Use Trapezoidal rule to find the value of $\int_0^2 e^{x^2}\,dx$ by taking 10 intervals.

[2] [1] [1] [7]

OR

2a. Find the missing term for the following data by forward differences

X: 2 3 4 5 6

Y: 45.0 49.2 54.1 ..... 67.4

[2] [1] [1] [6]

2b. Find the polynomial by Newtons divided diffrence formula and hence find f(9)

x	5	7	11	13	17
f(x)	150	392	1452	2366	5202

[3] [1] [1] [7]

2c. UsingSimpsons1/3 rule evaluate

$\int_0^6 \frac{1}{1+x^2}\,dx$ taking 6 intervals

[1] [1] [1] [7]

MODULE 2

3a. State and prove addition Law of probability.

[2] [2] [1] [6]

3b. Given P(A)=1/4, P(B)=1/3 and P(A∪B)=1/2 Evaluate P(A/B),P(B/A), P(A∩B') and P(A/B').

[2] [2] [1] [7]

3c. Three machines $M_1M_2$and M_3produce 25%, 30% and the remainder of the total output respectively. Of their respective outputs 5% , 4% and 3% of the items are faulty. Find the proababilty that a selected item is faulty due to machine with highest output.

[3] [2] [1] [7]

OR

4a. A problem in Mechanics is given to three students A B and C whose chances of solving are 1/2 ,1/3 and 1/4 respectively. Find the probability that (i) the problem is solved (ii) problem is solved by at least one of them.

[2] [2] [1] [6]

4b. Given P(A)=1/2, P(B)=1/3 and P(A∩B)= 4 .Evaluate P(A∪B), P(B/A), P(A'/B').

[2] [2] [1] [7]

4c. There are three bags :first containing 1 white, 2 red, 3 green balls; second 2 white,3 red,1green and third 3 white,1 red , 2 green balls.Two balls drawn from a bag are chosen at random, found to be1 white and 1 red. Find the proababilty that the balls so drawn are from the second bag.

[3] [2] [1] [7]

MODULE 3

5a. Find the mean and standard deviation for the following distribution

x	8	12	16	20	24
p(x)	1/8	1/6	3/8	1/4	1/12

[2] [3] [1] [6]

5b. If the chance that one of the telephone lines is busy at given instant is 0.2.Find the probability that out of 10 (i) 5 of them are busy (ii) all lines are busy .Obtain the most probable number of busy lines.

[3] [3] [1] [7]

5c. If the probability of a bad reaction from certain injection is 0.001, determine the chance that out of 2000 individuals more than 2 will get a bad reaction, less than 2 will get a bad reaction

[3] [3] [1] [7]

OR

6a. Determine the value of 'k' so that the function
$f(x) = k\,(x+1)\ -1 \le x \le 1$
= 0 otherwise.
Also evaluate $P(0 < x < 1)$ and E(x)

[2] [3] [1] [6]

6b. The life of a compressor manufactured by a company is 200 months, follow an exponential distribution. Estimate the probability that life of a compressor is
(i)Less than 200 months (ii) between 100 and 200 months

[3] [3] [1] [7]

6c. Find the mean and standard deviation for the following distribution.

x	-3	6	9
p(x)	1/6	1/2	1/3

[2] [3] [1] [7]

MODULE 4

7a. Determine the (i)marginal distributions of x and y (ii) ρ(x,y) for the following data.

x\Y	-1	0	1
-1	0	0.2	0
0	0.1	0.2	0.1
1	0.1	0.2	0.1

[2] [4] [1] [6]

7b. If x and y are independent random variables then find the joint distribution of x and y. Also find the covariance (x,y)

x	1	2
p(x)	0.6	0.4

y	5	10	15
p(y)	0.2	0.5	0.3

[2] [4] [1] [7]

7c. Two cards are selected at random from a box which contains 5 cards numbered 1,1,2,2 and 3.Find the joint probability distribution of x and y where x denotes the sum ,y the maximum oftwo numbers drawn. Also determine covariance between x and y as well the corr coefficient.

[3] [4] [1] [7]

OR

8a. Determine the (i)marginal distributions of x and y (ii) find the conditional distribution h(x/y=1)(iii)Are x and y are independent?

x\Y	0	1	2
0	0.1	0.4	0.1
1	0.2	0.2	0

[2] [4] [1] [6]

8b. A fair coin is tossed thrice. Let X be denote 0 or 1 according as tail or head assuming on the firsttoss and Y as the number of tails. Determine
(i) Marginal distribution of X and Y.(ii)Joint P.D.F of (X,Y) (iii) Expected values of X +Y and XY

[3] [4] [1] [7]

8c. If x and y are independent random variables then prove that
E(xy)=E(x)E(y) (ii) var(x+y) = var(x)+var(y) (iii)Cov(x,y) = 0

[2] [4] [1] [7]

MODULE 5

9a. Define different types of stochastic processes. Define a markov chain and transition matrix

[1] [5] [1] [6]

9b. Find the steady state probability vector for the transition matrix,

$$A = \begin{bmatrix} \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \\ 0 & 1 & 0 \\ \frac{1}{2} & \frac{1}{2} & 0 \end{bmatrix}$$

[3] [5] [1] [7]

9c. A salesman visits three cities A B and C .If he visits city a he is equally likely to visit city B or C.If he visits city B he is twice likely to visit city A than B. Finally if he visits city C he visits B.Find the transition matrix and find the probability that he visits city C after 3 visits,given that he starts from city A.

[3] [5] [1] [7]

OR

10a. Define a regular stochastic matrix. Verify whether

$$A = \begin{bmatrix} 0 & 0 & 1 \\ \frac{1}{2} & \frac{1}{2} & 0 \\ 0 & 1 & 0 \end{bmatrix}$$

is a regular stochastic matrix.

[3] [5] [1] [7]

10b. Find the steady state probability vector for the transition matrix

$$: A = \begin{bmatrix} 0 & \frac{3}{4} & \frac{1}{4} \\ \frac{1}{2} & \frac{1}{2} & 0 \\ 0 & 1 & 0 \end{bmatrix}$$

[3] [5] [1] [7]

10c. Every year a man trades his car for a new car. If he has Maruti, he trades it for an Alto.If he has an Alto he trades it for Santro. However if he has Santro,he is just likely to trade it for a new Santro or Alto or Maruti. Write the transition matrix. If he has Maruti in 2018 what is the probability that he trades for Santro in 2022?

[3] [5] [1] [7]

USN | | | | | | | | | | **16DIPMATC51**

Fifth Semester B.E. Makeup Examination, January 2019

NUMERICAL METHODS AND PROBABILITY

Time: 3 Hours Max. Marks: 100

Instructions: 1. *Unit – II and Unit – IV are compulsory.*
2. *Answer any one main question in the remaining units.*
3. *Each main question carries 20 marks.*

UNIT - I

		L	CO	PO	M

1 a. Find the number of men getting wage of Rupees 43 from the following table:

Wages (in rupees)	40	50	60	70	80	90
No. of men	184	204	226	250	276	304

(2) (1) (1) (07)

b. Use Lagrange's interpolation formula to find the value of y when x = 5, for the following data

X	5	6	9	11
Y	12	13	14	16

(1) (1) (1) (07)

c. Evaluate using Simpson's 1/3rd rule $\int_0^1 \frac{1}{x^3+x+1}dx$, choose step length h = 0.25.

(1) (1) (1) (06)

OR

2 a. The area A of a circle of diameter D is given for:

D	80	85	90	95	100
A	5026	5674	6362	7088	7854

Calculate area of a circle of diameter 105.

(2) (1) (1) (07)

b. Obtain the Newton's divided difference interpolation polynomial and hence find f(2):

x	-1	0	1	3
f(x)	2	1	0	-1

(1) (1) (1) (07)

c. Evaluate $\int_4^{5.2} \log x\, dx$ using Weddle's rule. Take 7 ordinates.

(1) (1) (1) (06)

UNIT – II

3 a. When a coin is tossed four times, find the probability of getting (i) exactly one tail (ii) at most three tails and (iii) at least two tails.

(1) (2) (1) (07)

b. Let A and B be two events with $(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$ and $P(A \cap B) = \frac{1}{4}$. Find $P(A/B)$, $P(A \cup B)$ and $P(A'/B')$.

(1) (2) (1) (07)

c. Three machines A, B and C produce respectively 60%, 30% and 10% of the total number of items of a factory. The percentage of defective outputs of these machines are respectively 2%, 3% and 4%. An item is selected at random and found defective. Find the probability that the item was produced by machine C.

(1) (2) (1) (06)

L (Level), CO (Course Outcome), PO (Programme Outcome), M (Marks)

UNIT - III

4 a. A random variable x has the following probability function

X	-2	-1	0	1	2	3
P(x)	0.1	K	0.2	2k	0.3	k

(i) Find the value of k, mean and variance

(ii) Evaluate $(x > 0)$and $P(-2 < x < 3)$.

(1) (3) (1) (

b. The probability that a pen manufactured by a company will be defective is $\frac{1}{10}$. If 12 such pens are manufactured, find the probability that (i) exactly two will be defective (ii) at least two will be defect and (iii) none will be defective.

(1) (3) (1) (

c. If X is a normal variate with mean 30 and S.D. 5, then find the probabilities that (i) $26 \leq x \leq 40$ (ii) $x \geq 45$ (iii) $|x - 30| > 5$

(1) (3) (1) (

OR

a. Is the function defined below is a density function?

$$f(x) = \begin{cases} e^{-x}, & x \geq 0 \\ 0, & x < 0 \end{cases}$$

If so, determine the probability that the variate having this density will fall in the interval (1, 2) and t cumulative probability function f(2).

(1) (4) (1) (

b. In a certain factory turning out razor blades, there is a small chance of 0.002 for any blade t defective. The blades are supplied in packets of 10; use Poisson distribution to calculate the approxi number of packets containing no defective, one defective and two defective blades respectively consignment of 10,000 packets.

(1) (4) (1) (

c. In a normal distribution, 3% of the items are under 45 and 8% are over 64. Find the mean and S. D. o the distribution.

(1) (4) (1) (

UNIT - IV

In the following case, the joint probability distribution of two random variables X and Y is given in th following table.

Y / X	-3	2	4
1	0.1	0.2	0.2
3	0.3	0.1	0.1

Determine (i) marginal distribution of X and Y (ii) $Cov(X, Y)$ (iii) $\rho(X, Y)$ (iv) determine whether X a Y are independent.

(1) (4) (1) (

Find the joint distribution of X and Y, which are independent random variables with following respective distributions.

x_i	1	2
$f(x_i)$	0.7	0.3

y_i	-2	5	8
$g(y_i)$	0.3	0.5	0.2

Determine (i) $Cov(X, Y)$ (ii) $\rho(X, Y)$.

(1) (4) (1) (

Note: L (Level), CO (Course Outcome), PO (Programme Outcome), M (Marks)

c. A coin is tossed three times. $X = 0$ or 1 according as tail or head occurring on the first toss and Y is the number of tails. Determine (i) The marginal distributions of X and Y (ii) Joint P. D. F. of X and Y (iii) Expected values of $X + Y$ and XY.

(1) (4) (1) (06)

UNIT -V

7 a. Define Probability vector and Fixed probability vector. Find the fixed probability vector of the regular stochastic matrix: $P = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ \frac{1}{2} & \frac{1}{2} & 0 \end{bmatrix}$.

(1) (5) (1) (07)

b. Three boys A, B and C are throwing a ball to each other's randomly. 'A' always throws to 'B' and 'B' always throws to 'C'. 'C' is as likely to throw to 'B' as to 'A'. They never throws to themselves. Determine the transition matrix of Markov chain. Find the probabilities, (i) A has (ii) B has (iii) C has, the ball on forth throw.

(1) (5) (1) (07)

c. Every year, a man trades his car for a new car. If he has a Maruti, he trades it for an Ambassador. If he has Ambassador, he trades it for a Santro. However, if he has a Santro, he is just as likely to trade it for a new Santro as to trade it for a Maruti or an Ambassador. In 2000 he bought his first car, which was a Santro. Find the probability that he has (i) Santro and Maruti in the year 2002 (Ii) Santro and Ambassador in the year 2003.

(1) (5) (1) (06)

OR

8 a. Show that $C = \begin{bmatrix} 0 & 0 & 1 \\ \frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 1 & 0 \end{bmatrix}$ is regular stochastic matrix.

(1) (5) (1) (07)

b. A software engineer goes to his work-place every day by motor bike or by car. He never goes by bike on two consecutive days. If he goes by car on a day then he is equally likely to go by car or by bike next day. Find the transition matrix for the markov chain. If the car is used on the first day, find the probability that (i) bike is used (ii) car is used on the fifth day.

(1) (5) (1) (07)

c. A student study habits are as follows. If he studies one night he is 60% sure not to study the next night. If he does not study one night, he is 80% sure to study the next day. In the long run how often does he study.

(1) (5) (1) (06)

USN | | | | | | | | | | 16DIPMATC51

Fifth Semester B.E. Semester End Examination, Dec/Jan 2018-19
NUMERICAL METHODS AND PROBABILITY

Time: 3 Hours Max. Marks: 100

Instructions: 1. *UNIT II and UNIT IV are compulsory*
2. *Max. Marks will be scaled to 50 marks for SGPA and CGPA calculations.*
3. *Answer any one full question from remaining each unit.*

UNIT - I

L CO PO M

1 a. Find $y(1.4)$, given the data:

x	1	2	3	4	5
Y	10	26	58	112	194

(1) (1) (1) (06)

b. Use Newton's divided difference formula to find $f(4)$, given the data:

x	0	2	3	6
f(x)	-4	2	14	158

(1) (1) (1) (07)

c. Find the approximate value of $\int_0^{\frac{\pi}{2}} \sqrt{\cos\theta}\, d\theta$ by Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule.

(1) (1) (1) (07)

OR

2 a. For the following data, find $f^1(1)$ and $f^{11}(3)$,

x	0	2	4	6	8
f(x)	7	13	43	145	367

(1) (2) (1) (06)

b. The following table gives the normal weights of babies during first months of life. Estimate the weight of baby at the age of seven months using Lagrange's interpolation formula.

Age(in months)	0	2	5	8
Weight(in pounds)	6	10	12	16

(1) (2) (1) (07)

c. Evaluate $\int_0^3 \frac{dx}{(1+x)^2}$ by Simpson's $\left(\frac{3}{8}\right)^{th}$ rule.

(1) (2) (1) (07)

UNIT II

3 a. A box M contains 2 white and 4 black balls. Another box N contains 5 white and 7 black balls. A ball is transferred from box M to box N. Then the ball is drawn from the box N. Find the probability that it is white.

(1) (2) (1) (06)

b. Given $P(A) = \frac{1}{4}, P(B) = \frac{1}{3}, P(A \cup B) = \frac{1}{2}$, evaluate $P\left(\frac{A}{B}\right), P\left(\frac{B}{A}\right)$, $P(A \cap B^1)$ and $P\left(\frac{A}{B^1}\right)$

(1) (2) (1) (07)

*Note: **L** : Level, **CO** : Course Outcome, **PO** : Programme Outcome, **M** : Marks*

c. The chance that a doctor will diagnose disease correctly 60%. The chance that a patient will d[illegible] after correct diagnose is 40% and chance of death by wrong diagnose is 70%. If a patient dies, wh[illegible] is the chance that his disease was correctly diagnosed?

(1) (2) (1) (0[illegible]

UNIT III

4 a. The p.d.f of variate X is given by the following table.

X	0	1	2	3	4	5	6
P(X)	K	3K	5K	7K	9K	11K	13K

For what value of K, this represents a valid probability distribution? Also find $P(x \geq 5)$ and $P(0 < x \leq 6)$.

(1) (3) (1) (06)

b. Is the following function a density function?

$f(x) = \begin{cases} e^{-x}, & x \geq 0 \\ 0, & x < 0 \end{cases}$

If so, find. P(1<x<2)

(2) (3) (1) (07)

c. When a coin is tossed 4 times, find the probability of getting (i)exactly one head (ii) at most heads (iii)at least 2 heads. Use Binomial distribution.

(1) (3) (1) (0[illegible]

OR

5 a. A random variable X has the following probability function.

X	0	1	2	3	4	5	6	7
P(X)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2$+K

(i)Find the value of K (ii)Evaluate $P(X < 6), P(X \geq 6)$ (iii) $P(0 < X < 5)$.

(1) (3) (1) (07)

b. A random variable x has the following density function

$f(x) = \begin{cases} kx^2, & -3 \leq x \leq 3 \\ 0, & otherwise \end{cases}$

Evaluate k and find (i) $P(1 \leq x \leq 2)$ (ii) $P(x \leq 2)$ (iii) $P(x > 1)$

(1) (3) (1) (07)

c. If x is an exponential variate with mean 3, find (i) $P(x > 1)$ (ii) $P(x < 3)$.

(1) (4) (1) (0[illegible]

UNIT-IV

6 a. The joint PDF of two random variables X and Y is given in the following table.

X \ Y	-4	2	7
1	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{8}$
5	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{8}$

Find (i) The marginal distribution of X and Y (ii) COV(X,Y) and (iii) $\rho(X,Y)$.

(1) (4) (1) (06)

b. A coin is tossed three times. X=0 or 1 according as tail or head occurring on the first toss and Y is the number of tails. Determine (i) The marginal distributions of X and Y (ii) Joint P.D.F of X and Y (iii) Expected values of X+Y and XY.

(2) (4) (1) (07)

*Note: **L** : Level, **CO** : Course Outcome, **PO** : Programme Outcome, **M** : Marks*

c. Find the joint distribution of X and Y, which are independent random variables with the following respective distribution:

x_i	1	2
$f(x_i)$	0.7	0.3

y_i	-2	5	8
$g(y_i)$	0.3	0.5	0.2

(1) (4) (1) (07)

UNIT-V

7 a. Find the fixed probability vector of the regular Stochastic matrix

$$P=\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1/2 & 1/2 & 0 \end{bmatrix}$$

(1) (4) (1) (06)

b. Three boys P,Q,R are throwing a ball to each other randomly. P always throws to Q and Q always to R, R is as likely to throw to Q as to P. They never throw to themselves. Find the probabilities P , Q and R has the ball on fourth throw.

(2) (4) (1) (07)

c. A sales man sells an article in three cities X,Y, Z. He never sells in the same city on successive days. If he sells in city X on a day, next day he sells in city Y. If he sells in either Y or Z then next day he is twice as likely to sell in city X compared to other city. Find the transition matrix of this Markov chain.

(2) (5) (1) (07)

OR

8 a. Find the unique fixed probability vector of

$$M=\begin{bmatrix} 0 & 1/2 & 1/2 \\ 1/3 & 2/3 & 0 \\ 0 & 1 & 0 \end{bmatrix}$$

(1) (5) (1) (06)

b. A student's study habits are as follows. If he studies one night he is 60% sure not to study the next night. If he does not study one night, he is 80% sure to study the next day. In the long run how often does he study.

(1) (5) (1) (07)

c A software engineer goes to his work-place every day by motor bike or by car. He never goes by bike on two consecutive days. If he goes by car on a day then he is equally likely to go by car or by bike next day. Find the transition matrix for the Markov chain. If the car is used on the first day find the probability that (i) Bike is used (ii)Car is used on the fifth day.

(1) (5) (1) (07)

Fifth Semester B.E. Semester End Examination, Dec. /Jan. 2019-20

NUMERICAL METHODS AND PROBABILITY

Time: 3 Hours

Max. Marks: 100

Instructions: 1. *Answer any one full question from each unit.*
2. *Use of Statistical table will be permitted.*

UNIT - I

L CO PO M

1 a. Given : $f(3) = 2.7$, $f(5) = 12.5$, $f(7) = 34.3$, and $f(9) = 72.9$. Using Newton's forward difference find the value of $f(4)$.

(1) (1) (1) (06)

b. Find the interpolating polynomial using Newton's divided difference using following data

X	0	2	3	6
f(x)	-4	2	14	158

(1) (1) (1) (07)

c. A curve is drawn to pass through (x, y) given by the following data:

X	1	1.5	2	2.5	3	3.5	4
f(x)	2	2.4	2.7	2.8	3	2.6	2.1

Find the area bounded by the curve $y = f(x)$ using (i) Simpson's $1/3^{rd}$ Rule and (ii) Weddle's Rule.

(2) (1) (1) (07)

OR

2 a. Using Newton's backward interpolation formula find the interpolating polynomial for the function given by the following data:

X	10	11	12	13
f(x)	21	23	27	33

(1) (1) (1) (06)

b. Use Lagrange's formula to find $f(4)$, given that

X	0	2	3	6
f(x)	-4	2	14	158

(1) (1) (1) (07)

c. Using Simpson's $1/3^{rd}$ method evaluate $\int_1^8 e^{\frac{1}{x}} dx$, dividing [1,8] into 7 equal parts.

(1) (1) (1) (07)

UNIT – II

L CO PO M

3 a. A bag contains 40 tickets numbered 1,2,3, ... , 40 of which four are drawn at random and arranged in ascending order such that $t_1 < t_2 < t_3 < t_4$. Find the probability of t_3 being 25.

(1) (2) (1) (06)

b. A box A contains 2 white and 4 black balls. Another box B contains 5 white and 7 black balls. A ball is transferred from box A to box B, and then a ball is drawn from box B. Find the probability that it is white.

(2) (2) (1) (07)

c. In a bolt factory machines A, B, and C manufactured 25%, 35% and 40% of the total of their output. 5%, 4% and 2% are defective bolts. A bolt is drawn at random from the product and it is found to be defective. What are the probabilities that it was manufactured by machine B, or C.?

(1) (2) (1) (07)

OR

4 a. State and prove Baye's theorem.

(1) (2) (1) (06)

b. A committee consists of 9 students, 2 of which are from first year, 3 are from second year and 4 are from third year. Three students are to be removed at random what is the chance that (i) 3 students belong to different class (ii) 2 students belonging to the same class and third from the other class (iii) 3 students belonging to the same class?.

(1) (2) (1) (07)

c. In a school 25% of the students failed in first language, 15% of the students failed in second language and 10% of the students failed in both. If a student is selected at random find the probability that

(i) He failed in first language if he had failed in the second language.
(ii) He failed in second language if he had failed in the first language
(iii) He failed in either of the two languages.

(2) (2) (1) (07)

L CO PO M

UNIT - III

5 a. A random variable X has the following probability function

X	0	1	2	3	4	5	6
$P(X)$	k	3k	5k	7k	9k	11k	13k

(i) For what values of k, this represents a valid probability distribution? (ii) Find $P(X <$ $)$ $P(X \geq 5)$, $P(3 < X \geq 6)$.

(1) (3) (1) (07)

b. The probability that a pen manufactured by a company will be defective is 1/10. If 12 such pens are manufactured, find the probability that (i) exactly 2 will be defective (ii) at least 2 will be defective.

(1) (3) (1) (07)

c. In a test on 2000 electric bulbs, it was found that the life of a particular make, was normally distributed with an average life of 2040 hours and standard deviation 60 hours. Estimate the number of bulbs likely to burn for (i) more than 2150 hours and (ii) less than 2160 hours.

(1) (3) (1) (06)

OR

6 a. Four coins are tossed. What is the expectation of number of heads?

(1) (3) (1) (07)

b. Obtain the mean and standard deviation of binomial distribution.

(1) (3) (1) (07)

c. Fit a Poisson distribution to the set of observations.

x	0	1	2	3	4
f	122	60	15	2	1

(2) (3) (1) (06)

L CO PO M

UNIT - IV

7 a. If X and Y are independent random variables, then prove that

(i) $E(XY) = E(X)E(Y)$
(ii) $Var(X+Y) = Var(X) + Var(Y)$
(iii) $Cov(X,Y) = 0.$

(1) (4) (1) (06)

b. Determine (i) marginal distribution of X and Y (ii) $Cov(X,V)$ and (iii) $\rho(X,Y)$ for the following JPD.

X \ Y	-4	2	7
1	1/8	1/4	1/8
5	1/4	1/8	1/8

(1) (4) (1) (07)

Note: L (Level), CO (Course Outcome), PO (Programme Outcome), M (Marks)

c. Evaluate conditional distributions $h(x/1)$ for the following joint distribution. Show that X and Y are not independent.

$X \backslash Y$	1	2	3
1	1/12	1/6	0
2	0	1/9	1/5
3	1/18	1/4	2/15

(2) (4) (1) (07)

OR

a. A fair coin is tossed three times. Let X denotes 0 or 1 according as tail or head occurring on the first toss and Y is the number of tails. Determine (i) marginal distribution of X and Y (ii) Joint PDF of X and Y (iii) Expectation of X and Y.

(1) (4) (1) (06)

b. If X and Y are independent random variables then find the joint distribution of X and Y with the following marginal distribution of X and Y. Determine $\rho(X,Y)$

X	1	2
P (x)	0.7	0.3

Y	-2	5	8
P(y)	0.3	0.5	0.2

(1) (4) (1) (07)

c. Determine (i) marginal distribution of X and Y (ii) Find the conditional probability $h(x/y=1)$ where

$X \backslash Y$	0	1	2
0	0.1	0.4	0.1
1	0.2	0.2	0

(1) (4) (1) (07)

UNIT -V

L CO PO M

9 a. Find the unique fixed probability vector of $P=\begin{bmatrix} 0 & 3/4 & 1/4 \\ 1/2 & 1/2 & 0 \\ 0 & 1 & 0 \end{bmatrix}$

(1) (5) (1) (06)

b. A salesman's territory consists of three cities A, B and C. He never sells in the same city on successive days. If he sells in city A, then the next day he sells in city B. However if he sells in either B or C, then the next day he is twice as likely to sell in city A as in other city. In the long run, how often does he sell in each of the cities?

(1) (5) (1) (07)

c. A man smoking habits are as follows. If he smokes filter cigarettes one week, he switches to non filter cigarettes next week with probability 0.2. On the other hand if he smokes non filter cigarettes one week there is probability of 0.7 that he will smoke non filter cigarettes the next week as well. In the long run how often does he smoke filter cigarettes?

(2) (5) (1) (07)

OR

10 a. Define the following:

(i) Unique fixed probability vector.

(ii) Regular Stochastic Matrix.

(iii) Markov Chain.

(1) (5) (1) (06)

b. Find the unique fixed probability vector of $P = \begin{bmatrix} 0 & 1/2 & 1/2 \\ 1/3 & 2/3 & 0 \\ 0 & 1 & 0 \end{bmatrix}$

(1) (5) (1) (07)

c. A software engineer goes to his office every day by motor bike or by car. He never goes by bike on two consecutive days. If he goes by car on a day then he is equally likely to go by car or by bike next day. Find the transition matrix for the markov chain. If the car is used on the first day find the probability that (i) Bike is used (ii) car is used on the fifth day.

(2) (5) (1) (07

Common subject