C) The chances that doctor A will diagnose a disease X correctly is 60%. The chances that a patient will die by his treatment after correct diagnosis is 40% and the chance of death by wrong diagnosis is 70%. A patient of doctor 'A' who had disease X, died. What is the chance that his disease was diagnosed correctly? (4)

3) Let (X,Y) have the joint probability density function given by $f(x,y) = \begin{cases} 1, if\ |y| < x, 0 < x < 1 \\ 0, otherwise \end{cases}$. Find the regression equations of Y on X and X on Y. (3)

A)

B) A petrol pump is supplied with petrol once a day. If its daily volume of sales (X) in thousands of litres is distributed by $f(x) = 5(1-x)^4, 0 < x < 1$, what must be the capacity of its tank in order that the probability that its supply will be exhausted in a given day shall be 0.01? (3)

C) There are 600 Data Science students in the post graduate classes of a university, and the probability for any student to need a copy of a particular book from the university library on any day is 0.05. How many copies of the book should be kept in the university library so that the probability may be greater than 0.90 that none of the students needing a copy from the library has to come back disappointed? (4)

4) Two independent random variable X and Y have mean 6 and 9 and variance 16 and 25 respectively. Find the correlation coefficient between U = 4X-3Y and V = X+3Y. (3)

A)

B) The intelligence quotients (IQ) of a random sample of ten boys are 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean IQ of 100? Test this at 5% level of significance. The threshold value is 2.26. Also find a 95% confidence interval for the mean of the population. (3)

C) Fit a parabola for the following data and estimate the value of y for x=3.5 (4)

x	1	2	3	4	6	8
y	2.4	3	3.6	4	5	6

5) The table below shows the data collected during the outbreak of small pox. Clearly stating the hypothesis, test the effectiveness of vaccination in preventing small pox at 5% level of significance. The cutoff value at 5% level of significance is 3.84.

A) (3)

	Attacked	Not Attacked
Vaccinated	31	469
Non vaccinated	185	1315

B) Solve using Crank-Nicolson's method, the heat equation $u_t = u_{xx}, 0 < x < 1, t > 0,\ u(x,0) = 100(x-x^2),\ u(0,t) = u(1,t) = 0$. With $h = \frac{1}{4}$ and $\lambda = 1$, compute u for two time steps. (3)

C) A test was given to five students taken at random from the fifth class of three schools (4)

Exam Date & Time: 22-Dec-2022 (09:30 AM - 12:30 PM)

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MANIPAL ACADEMY OF HIGHER EDUCATION

III Semester BTECH DATA SCIENCE & ENGINEERING, End Semester Examination, DECEMBER 2022

MATHEMATICAL FOUNDATIONS FOR DATA SCIENCE - I [MAT 2157]

Marks: 50 **Duration: 180 mins.**

Descriptive Questions

Answer all the questions. Section Duration: 180 mins

1) The scores in Economics of 250 candidates appearing at an examination have mean 39.72, variance 97.80, third central moment -114.18 and fourth central moment 28396.14. Examine the skewness and kurtosis of the distribution. (3)

A)

B) An analysis of monthly wages paid to the workers of two firms A and B belonging to the same industry gives the following results. (3)

Various measures	Firm A	Firm B
No.of workers	500	600
Average daily wage in Rupees	186.00	175.00
Variance of distribution of wages in Rupees	81	100

In which firm is there greater variability in individual wages? Also determine the combined arithmetic mean and standard deviation of the two firms.

C) Find the median and mode for the distribution given below. (4)

Class Interval	5-10	10-15	15-20	20-25	25-30	30-35	35-40
Frequency	6	8	17	21	15	11	2

2) A fair coin is tossed until a head appears. What is the expected number of tosses required to obtain a head? (3)

A)

B) An insurance company insures 4000 people against loss of both eyes in a car accident. Based on previous data, the rates were computed on the assumption that on the average 10 persons in 100000 will have car accident each year that result in this type of injury. What is the probability that more than three of the insured will collect on their policy in a given year? (3)

of a town. The individual scores are as follows.

School 1	9	7	6	5	8
School 2	7	4	5	4	5
School 3	6	5	6	7	6

Stating clearly the hypothesis and the assumptions, carry out the analysis of variance for the above data and state your conclusions based on 1% level of significance. $F(2, 12)=6.93$, $F(2, 14)=2.73$, $F(12, 14)=2.05$.

-----End-----