Engineering Mathematics – 4

19MHB211A

Tutorial and Assignment – 3

Tutorial-3

1. Solve the Laplace equation

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0, 0 \leq x \leq 1, 0 \leq y \leq 1,$$

subject to the boundary conditions

$$\begin{aligned} u(x,0) &= 0,\ u(x,1) = \sin(x), 0 \leq x \leq 1; \\ u(0,y) &= 0,\ u(1,y) = 0, 0 \leq y \leq 1. \end{aligned}$$

2. The data obtained in the study of the number of absences and the final grade of the seven students in the mathematics class is given in Table 1.

Number of absences x	6	2	15	9	12	5	8
Final grade y (%)	82	86	43	74	58	90	78

Table 1

   (a) Find the correlation coefficient between absences and final grade.

   (b) Find the regression line y=ax+b.

3. For the given data in Table 2.

x	0	2	3	5	6	7
y	5.8	5.7	5.2	2.8	1.9	2.2

Table 2

   (a) Find the correlation coefficient between absences and final grade.

   (b) Find the regression line y=ax+b.

   (c) Find the value of y at x=3.5.

4. The number of chocolates sold in an outdoor snack bar for different temperatures on various days are given Table 3.

Temperature C(x)	2	8	12	16	18
Number of chocolates (y)	45	35	17	15	6

Table 3

(a) Calculate correlation coefficient

(b) Estimate y corresponding to $x = 13$ using regression line of y on x.

5. Age and ln urea for 20 patients attending an accident and emergency unit are given in Table 4.

Subject	Age (years)	ln urea
1	60	1.099
2	76	1.723
3	81	2.054
4	89	2.262
5	44	1.686
6	58	1.988
7	55	1.131
8	74	1.917
9	45	1.548
10	67	1.386
11	72	2.617
12	91	2.701
13	76	2.054
14	39	1.526
15	71	2.002
16	56	1.526
17	77	1.825
18	37	1.435
19	64	2.460
20	84	1.932

Table 4

Find correlation coefficient and regression line.

6. For A, B and C the chances of being selected as the manager of a firm are in the ratio 4:1:2 respectively. The respective probabilities for them to introduce a radical change in marketing strategy are 0.3, 0.8 and 0.5. If the change does take place, find the probability that it is due to the appointment of B or C?

7. In a state lottery, a player must choose 8 of the numbers from 1 to 40. The lottery commission then performs an experiment that selects 8 of these 40 numbers. What is the probability that player has

   (a) All 8 of the numbers selected by lottery commission?

   (b) 7 of the numbers selected by lottery commission?

   (c) Atleast 6 of the numbers selected by lottery commission?

8. 10 cards are randomly chosen from a deck of 52 cards that consists of 13 cards of each of 4 different suits. Each of the selected cards is put in one of 4 piles, depending on suit of the card.

   (a) What is the probability that largest pile has 4 cards, the next largest has 3, the next largest has 2 and the smallest has 1 card?

   (b) What is the probability that 2 of the piles have 3 cards, one has 4 cards and one has no cards

Assignment – 3

Question No. 1(ILO 4) Approximate the solution to the following heat equation upto second time level using Schmidth method with $h = \frac{1}{4}$ and $k = \frac{1}{2}$.

$$\frac{\partial u}{\partial t} = \frac{1}{16}\frac{\partial^2 u}{\partial x^2}$$

subjected to

$$\begin{aligned} u(0,t) &= u(1,t) = 0, t > 0, \\ u(x,0) &= 2\sin(2\pi x), 0 \leq x \leq 1. \end{aligned}$$

(5 marks)

Question No. 2(ILO 4) A random sample of income from the users of a telecom company showed in Table 5.

Numer of users(x) (in millions)	26	29	32	34	36	37	40
Income(y)(in billions)	48	68	66	69	76	67	84

Table 5

(a). Obtain the correlation coefficient and comment on the type of relation between the variables.

(b). Determine the regression line between the variables.

(5 marks)

Question No. 3(ILO 5)

Two groups are competing for the position on the board of directors of a corporation. The probabilities that the first and the second groups will win are 0.6 and 0.4 respectively. Further, if the first group wins, the probability of introducing a new product is 0.7 and the corresponding probability is 0.3 if the second group wins. Find the probability that the new product introduced was by the second group. (5 marks)

Note: Submit assignment to the respective course leader.