**ASSIGNMENT-2**

**Week 5 –week 7**

**QUANTITATIVE METHODS**

**(STAT-201)**

**Student Full Name**:

**Student ID**:

**CRN No**.:

**Note**: 1. All the questions are compulsory.

2. Due date: November 02, 2017 11:59 PM

3. Points: Section-I 1×6=6

Section-II 1×6=6

Section-III 6×3=18

Total 30

**Section-I**

***State whether the following statements are True or False.* (1×6 = 6)**

1. In the equation y = mx+c, y is independent variable. False
2. The scatter diagram is generally used to investigate the relationship between variables.

True

1. First in, First out is not a basic characteristic of a waiting line. False
2. A bank with a single queue to move customers to several tellers is an example of a Multi-channel system. True
3. In L.P.P objective function is necessary in both maximization and minimization problems. True
4. In L.P.P resource restrictions are called constraints. True

**Section-II**

***Circle/tick the right answer from the answers given below.* (1×6 = 6)**

1. The random error is a regression equation
2. is the predicted error
3. includes both the positive and negative terms
4. will sum to a large positive number
5. estimates the accuracy of the slope
6. Which of the following represents the linear model for hypothesis testing
7. y = b0 + b1X + ε
8. y = b0 + b1 + ε
9. y = b0X
10. none of these
11. In queuing theory, the calling population is another name for
12. queue size
13. the servers
14. service rate
15. the arrivals
16. Which of the following is not a valid queuing model based on the Kendall’s notation
17. M/M/0
18. M/M/1
19. M/D/1
20. M/M/m
21. Infeasibility in a L.P.P problem occurs when there is
22. infinite solutions
23. a constraint is redundant
24. there is no solutions that satisfies the given constraint
25. none of these
26. Which of the following is not a part of L.P.P
27. objective function
28. a set of constraints
29. optimization of a linear function
30. a redundant constraint

**Section-III**

**Answer the following Essay Type Questions (6**×3=18)

1. In a simple regression model study, the following results are found:

The regression line is 5+2.X

Given and,

.

Calculate SST, SSE, SSR and r2

Solution:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | SST | SSE | SSR | r2 |
| Formula |  |  | SST – SSE | SSR/SST or  1-SSE/SST |
| Numerical result | 26 | 4 | 22 | 0.8461 |

1. Fit a regression curve to the following data

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| X | 1 | 3 | 5 | 7 | 9 |
| Y | 15 | 18 | 21 | 24 | 22 |

Solution:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| X | Y | (X-) | (Y-) | (X-)(Y-) | (X-)2 |
| 1 | 15 | -4 | -5 | 20 | 16 |
| 3 | 18 | -2 | -2 | 4 | 4 |
| 5 | 21 | 0 | 1 | 0 | 0 |
| 7 | 24 | 2 | 4 | 8 | 4 |
| 9 | 22 | 4 | 2 | 8 | 16 |
| ∑X = 25 | ∑Y = 100 |  |  | ∑ (X-)(Y-) = 40 | ∑ (X-)2 = 40 |

n = 5

= ∑X **÷** 5 **=** 25 ÷ 5 = 5

= ∑Y **÷** 5 **=** 100 ÷ 5 = 20

b1 =  = = 1

b0 = – b1 = 20 - 1×5 = 20 – 5 = 15

Therefore,

Y = 15 + 1× X

Y = 15 + X is the regression line

1. The SEU students open a ticket on “support system” to have solved their university

account problem. Students’ tickets arrival is best described by Poisson distribution with mean of 4 tickets submitted per hour. The support system server can help an average one student in 10 minutes, with the service rate being described by an exponential distribution. Calculate the following characteristics of the service system:

1. The average time a student’s ticket waits in the system.
2. Probability that the system is idle.

Solution :

λ = 4, μ = 60/10 = 6.

1. =hour = 30 minutes

b.

1. In Tyson’s mechanic shop customers arrive at the rate of 3 per hour and the Tyson’s mechanic can install wheels at the rate of 6 per hour. Then calculate L ,W and Lq as per M/M/1 model where,
2. L = average no of customers in the system
3. W = average time a customer spends in the system
4. Lq =  average no of customers in the queue

Solution:

Here, μ = 6 and λ = 3

a. L = = = = 1

b. W = = =

c. Lq = = = =

1. Susanna Nanna is the production manager for a furniture manufacturing company. The company produces tables and chairs. Each table generates a profit of $80 and requires 4 hours of assembly time and 5 hours of finishing time. Each chair generates $50 of profit and requires 4 hours of assembly time and 3 hours of finishing time. There are 340 hours of assembly time and 250 hours of finishing time available each month. The company must fill an order for 20 tables.

Formulate the problem as a linear program.

Solution:

Decision variables:

T= number of tables to produce each month

C= number of chairs to produce each month

Objective function: Maximize Z = 80 T+50 C

Subject to :

4T+4C ≤ 340

5T+3C ≤ 250

T ≥ 20

T, C ≥0

1. Using graphical method to solve the Linear Programming Problem

Maximize = 6𝑥 + 7𝑦

Subject to 2𝑥 + 3𝑦 ≤ 12

2𝑥 + 𝑦 ≤ 8

𝑥, 𝑦 ≥ 0

Solution



|  |  |
| --- | --- |
| Coordinates | 𝑍 = 6𝑥 + 7𝑦 |
| (0,0) | 0 |
| (0,4) | 𝑍 = 28 |
| (4,0) | 𝑍 = 24 |
| (3,2) | 𝑍 = 32 |

The maximum value is 𝑍 = 32 at the point (3,2).