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**GARISSA UNIVERSITY**

**UNIVERSITY EXAMINATION 2020/2021 ACADEMIC YEAR ONE**

**FIRST SEMESTER EXAMINATION**

**SCHOOL OF BUSINESS AND ECONOMICS**

**FOR THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION**

**COURSE CODE: MBA 817**

**COURSE TITLE: QUANTITATIVE TECHNIQUE II**

**EXAMINATION DURATION: 2 HOURS**

**DATE: 06/04/2021 TIME: 3.00-5.00 PM**

**INSTRUCTION TO CANDIDATES**

* **The examination has FIVE (5) questions**
* **Question ONE (1) is COMPULSORY**
* **Choose any other TWO (2) questions from the remaining FOUR (4) questions**
* **Use sketch diagrams to illustrate your answer whenever necessary**
* **Do not carry mobile phones or any other written materials in examination room**
* **Do not write on this paper**

**This paper consists of FOUR (4) printed pages *please turn over***

**QUESTION ONE (COMPULSORY)**

1. Define the following term as used in operation research
2. Multi-channel facility
3. Optimal solution.
4. Service Mechanism
5. Jockeying
6. Service in random order [5 Marks]
7. There is a congestion of the platform of the railway station. The trains arrive at a rate of 30 train per day. The waiting time for any train to hump is exponentially distributed with an average of 36 minutes. Calculate
8. The mean queue size
9. The probability that the queue size exceeds 9 [6 Marks]
10. Kenya airways Airline uses 500 taillights per year. Each time an order for taillight is placed an ordering cost of Kshs. 5 is incurred. Each light cost 40 cents and the holding cost is 8 cents/light/year. Assume that demand occurs at a constant rate and shortages are not allowed.
11. What is the EOQ
12. How many orders will be placed each year
13. how much time will elapse between the placement of an order [6 Marks]
14. Trucks at a single platform weigh bridge arrive according to poisson probability distribution. The time required to weigh the truck follows an exponential probability distribution. The mean arrival rate is 12 trucks per day and the mean service rate is 18 trucks per day. Determine the following
15. The probability that no truck is in the system
16. The average time that a truck waits for weighing service to begin
17. The average number of trucks waiting for service
18. The probability that an arriving truck will have to wait for service

[8 Marks]

**QUESTION TWO (15 Marks)**

1. A small project composed of 8 activities whose time estimates are listed below

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Activities | | Time in weeks | | | |
|  | I | J | Optimistic (a) | Most likely (m) | Pessimistic (b) |
| A | 1 | 2 | 2 | 5 | 8 |
| B | 2 | 3 | 4 | 7 | 10 |
| C | 2 | 4 | 4 | 9 | 11 |
| D | 3 | 5 | 6 | 10 | 20 |
| E | 4 | 6 | 1 | 3 | 5 |
| F | 4 | 5 | 3 | 6 | 9 |
| G | 5 | 7 | 4 | 5 | 12 |
| H | 6 | 7 | 6 | 8 | 10 |

1. Develop a PERT network for the project
2. Find the critical path for the project
3. Compute the probability of completing the project in 36 weeks (9 marks)
4. A company is considering purchasing a new machine that is expected to save a considerable amount of operational cost associated with the current machine. The new machine cost Kshs 10, 000 and is expected to save a half a shilling per hour over the current. There is a considerable amount of uncertainty concerning the expected number of hours the company will actually use the new machine. The management of the company has the uncertainty in the basis of the following probability distribution.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No of hours | 1000 | 2000 | 3000 | 4000 |
| Probability | 0.1 | 0.3 | 0.5 | 0.3 |

Should the company buy the machine? (6 marks)

**QUESTION THREE (15 Marks)**

1. A poultry farmer desires to purchase three specific feeds F1, F2 and F3 whose units cost per kg are 30, 15, and 40 respectively. The intention is to provide proper vitamin content while at the same time minimize the cost of feeding. The minimum vitamin content needed per feed mix are 35 and 50 units for vitamin A and B respectively; 1 kg of F1 contribute 3 units of A and a unit of B; 1 kg of F2 contribute one unit of A and 2 units of B; 1 kg of F3 contribute 4 units of A and four units of B. Formulate the underlined linear programming problem and solve it using simplex method. (10 marks)
2. Solve the following transportation problem using the North West Corner [5 Marks]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | A | B | C | Availability |
| I | 120 | 77 | 26 | 3 |
| II | 90 | 150 | 140 | 6 |
| III | 20 | 20 | 50 | 2 |
|  | 6 | 3 | 5 |  |

**QUESTION FOUR (15 Marks)**

1. Discuss important assumptions made when formulating a linear programming model [3 Marks]
2. A manufacturer makes two products  and. The first requires 5 hours for processing, 3 hours for assembling and 4 hours for packaging. The second requires 2 hours for processing, 12 hours for assembling and 8 hours for packaging. The plant has 40 hours available for processing, 60 hours for assembling and 48 hours for packaging. The profit margin for is $7 and for it is $21. Express the data in equations and inequalities necessary to determine the output mix that will maximize profits. [12 Marks]

**QUESTION FIVE (15 Marks)**

1. In a departmental store one cashier is there to serve the customers. And the customer pick up their needs by themselves. The arrival rate is 9 customers for every 5 minutes and the cashier can serve 10 customers in 5 minutes. Assuming poisson arrival rate and exponential distribution for the serve rate. Find
2. Average number of customers in in the system
3. Average number of customers in the queue
4. Average time a customer spends in the system
5. Average number of customers waits before being served [8 Marks]
6. A company has 4 salesmen and 5 customers. The company has estimated the cost in dollars associated with assigning a particular salesman to a given specific client. These estimates are given in the table below

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Client | | | | | |
| Salesmen |  | 1 | 2 | 3 | 4 | 5 |
| A | 32 | 50 | 37 | 36 | 49 |
| B | 35 | 48 | 35 | 47 | 46 |
| C | 32 | 58 | 40 | 38 | 40 |
| D | 30 | 54 | 39 | 40 | 50 |

Determine who should be assigned which client and the minimum cost the company can incur (7 marks)