****

MAASAI MARA UNIVERSITY

**REGULAR UNIVERSITY EXAMINATIONS**

**2016/2017 ACADEMIC YEAR**

**THIRD YEAR SECOND SEMESTER**

**SCHOOL OF BUSINESS AND ECONOMICS**

**BACHELOR OF BUSINESS MANAGEMENT**

**COURSE CODE: BBM 355**

**COURSE TITLE: OPERATIONS RESEARCH I**

**DATE: 27TH APRIL 2017 TIME: 2.00PM-4.00PM**

**INSTRUCTIONS TO CANDIDATES**

* ***Answer question ONE (compulsory) and any other THREE***
* ***Question one carries 25 marks***
* ***All other questions carry 15 marks***

*This paper consists of 4 printed pages. Please turn over*

**QUESTION ONE**

1. Briefly but clearly explain the fundamental elements of queuing process.

**(6 Marks)**

b) Student’s arrival at a university cafeteria is at an average rate of 7 students per minute, which is slower than attendant service rate which is 6 students per minute. The manager of the cafeteria wishes to calculate the average number of students in the cafeteria, the average time each student spends in the queue and the average time each student spends the system. Assume that students arrive randomly at each time at the rate of 5 per minute. Calculate the operating statistics for this cafeteria. **(8Marks)**

c) Maximize z = 18x1 + 16x2

Subject to

15x­­1 + 25x2≤ 375

24x1 + 11x2≤ 264

X1, x2≥ 0

Use the graph to illustrate. **(6Marks)**

d) Discuss how transportation differs from assignment problem. **(5Marks)**

**QUESTION TWO**

Maasai Mara University Printing Press (MMUPP) uses 20,000 packets of paper each year. The ordering cost is Kshs.2,000 per order. Storage and usage costs have been estimated at Kshs.75 per packet per annum based on average annual stock. The price per packet is Kshs.1,200. The usual supplier has offered a 2% quantity discount if the MMUPP purchases 450 or more packets at any one time.

**Required;**

1. Compute EOQ. **(3Marks)**
2. Compute the total costs with EOQ situation. **(4Marks)**
3. Compute the total costs when quantity discount is offered. **(4Marks)**
4. Compare the two costs and advice MMUPP on the best decision.

**(4Marks)**

**QUESTION THREE**

1. Explain the difference between transportation and an assignment problem.

**(4 Marks)**

1. Explain maximization in an assignment problem with the help of an example.

**(4 Marks)**

1. What do you understand by **'two-person zero-sum game’**? **(2 Marks)**
2. What do you understand by a queue? Give some important applications of queuing theory. **(5Marks)**

**QUESTION FOUR**

1. The Highlands Milk Company has three plants located throughout the Country with production capacity 50, 75 and 25 gallons. Each day the firm must furnish its four retail shops R1, R2, R3, & R4 with at least 20, 20, 50, and 60 gallons respectively. The transportation costs (in Kshs.) are given below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Retails** | | | | |
| **Supply** | **R1** | **R2** | **R3** | **R4** | |
| **P1** | **3** | **5** | **7** | **6** | |
| **P2** | **2** | **5** | **8** | **2** | |
| **P3** | **3** | **6** | **9** | **2** | |  |
|  | | | | |

Distribute the available product to different retail shops in such a way so that the total transportation cost is minimum. **(5 Marks)**

b) Discuss the similarities and differences between the stepping stone method and the **MODI** method in solving a transportation problem. **(5 Marks)**

c) Under what circumstance is CPM a better technique than PERT? **(5 Marks)**

**QUESTION FIVE**

1. Write short notes on the following:
2. Sequencing decision problem for n jobs on two machines. **(2 marks)**
3. Sequencing decision problem for n jobs on three machines. **( 2Marks)**
4. A trader stocks a particular seasonal product at the beginning of the season and cannot reorder. The item costs him Kshs. 25 each and he sells at Kshs. 50 each. For any item that cannot be met on demand, the trader has estimated a goodwill cost of kshs. 15. Any item unsold will have a salvage value of kshs. 10. Holding cost during the period is estimated to be 10 percent of the price. The probability distribution of demand is given below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Units stocked** | **2** | **3** | **4** | **5** | **6** |
| **Probability of demand** | **0.35** | **0.25** | **0.20** | **0.15** | **0.05** |

Determine the optimal number of items to be stocked. **(6 Marks)**

1. The Highlands Diesel Company has to supply diesel engines to a truck manufacturer at a rate of 10 engines per day. The ordering cost is Kshs. 150 per order. The penalty in the contract is Kshs. 90 per engine per day late for missing the scheduled delivery date. The cost of holding an engine in stock for one month is Kshs. 140. His production process is such that each month (30 days) he starts procuring a batch of engines through the agencies and all are available for supply after the end of the month. Determine the maximum inventory level at the beginning of each month. **(5 Marks)**