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D.K.M.COLLEGE FOR WOMEN (AUTONOMOUS), VELLORE-1

SEMESTER EXAMINATIONS

 APRIL – 2018 15CPCO2D

# QUANTITATIVE TECHNIQUES FOR BUSINESS DECISIONS

Time : 3 Hrs Max. Marks : 75

**SECTION-A (5 x 6 = 30)**

**Answer ALL the questions.**

1. (a) A dietician wishes to mix two types of food in such a way that the Vitamin contents of the mixture

 contains at least 8 units of Vitamin A and 10 units of Vitamin B. Food I contains 2 units per kg of

 Vitamin A and 1 unit per kg of vitamin B while the food II contains 1 unit per kg of Vitamin A and 2

 units per kg of Vitamin B. It costs Rs. 5 per kg to purchase food I and Rs. 8 per kg to purchase food

 II. Prepare a mathematical model of the problem stated above

(Or)

 (b) The following table gives the activities of a project and their duration in days.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Activity: | 1 – 2 | 1 – 6 | 2 – 3 | 2 – 4 | 3 – 5 | 4 – 5 | 6 – 7 | 5 – 8 | 7 – 8 |
| Duration: | 7 | 6 | 14 | 5 | 11 | 7 | 11 | 4 | 18 |

 Draw the network diagram and find the critical path.

1. (a) State the reasons for holding inventory.

(Or)

(b) Anil & Co buy its annual requirement of 36,000 units in six installments. Each unit cost Re. 1 and

 ordering cost is Rs. 25. The inventory carrying cost is estimated at 20% of unit value. Find the total

 annual cost of the existing inventory policy. How much can be saved by using EOQ?

1. (a) Discuss a transportation problem as a linear programming model.

(Or)

 (b) Solve the following transportation problem.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | $$D\_{1}$$ | $$D\_{2}$$ | $$D\_{3}$$ | $$D\_{4}$$ | Availability |
| Origin | $$O\_{1}$$ | 1 | 2 | 1 | 4 | 30 |
| $$O\_{2}$$ | 3 | 3 | 2 | 1 | 50 |
| $$O\_{3}$$ | 4 | 2 | 5 | 9 | 20 |
| Requirement |  | 20 | 40 | 30 | 10 | 100 |

1. (a) Give a mathematical formulation of assignment problem.

(Or)

 (b) Solve the following assignment problem.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 |
| A | 12 | 10 | 15 | 22 | 18 | 8 |
| B | 10 | 18 | 25 | 15 | 16 | 12 |
| C | 11 | 10 | 3 | 8 | 5 | 9 |
| D | 6 | 14 | 10 | 13 | 13 | 12 |
| E | 8 | 12 | 11 | 7 | 13 | 10 |

1. (a) Customers arrive at a box office window, being manned by a single individual according to

 a Poisson input process with a mean rate of 30 per hour. The time required to serve a customer

 has an exponential distribution with a mean of 90 seconds. Find the waiting time of a customer.

(Or)

 (b) At a petrol bunk, customers arrive in a Poisson process with an average time of 5 minutes between

 arrivals. The time-intervals between services follow exponential distribution with a mean time of 2

 minutes. By how much should the flow of customers be increased to justify the opening of a second

 service point if the management is willing to open the same provided the customer has to wait for 5

 the service?

**SECTION-B (3 x 15 = 45)**

**Answer any THREE of the following questions.**

1. An agriculturist has a farm with 125 acres. He produces Radish, Muttar and Potato. Whatever he raises is fully sold in the market. He gets Rs. 5 for Radish per kg, Rs. 4 for muttar per kg and Rs. 5 for potato per kg. The average yield is 1,500 kg of Radish per acre 1,800 kg of muttar per acre and 1,200 kg of potato per acre.

To produce each 100 kg Radish and Muttar and to produce each 80kg of potato, a sum of

Rs. 12.50 has to be used for manure. Labour required for each acre to raise the crop is 6 man days for Radish and potato each and 5 man days for mutter. A total of 500 man days of labour at a rate of Rs. 40 per day are available.

Formulate this as a linear programming model to maximize the agriculturist’s total profit.

1. The annual demand for an item is 3200 units. The unit cost is Rs.6 and inventory carrying charges 25% per annum. If the cost of one procurement is Rs.150, determine
	* 1. Economic ordering quantity
		2. Number of orders per year
		3. Time between two consecutive orders
		4. The optimal cost
2. Solve the following transportation problem using Vogel’s method in order to minimise total

transportation cost.

 Origin D1 D2  D3  D4 D5 Availability

|  |  |
| --- | --- |
| 3 5 8 9 115 4 10 7 102 5 8 7 510 15 25 30 40 |  20  40 30 30 |
|  120 |

 O1

 O2

 O3

Requirements

1. Four jobs can be processed on four different machines, one job on one machine. Resulting times in minutes vary with assignments. They are given below:

 Machines

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | A | B | C | D |
| I | 42 | 35 | 28 | 21 |
| II | 30 | 25 | 20 | 15 |
| III | 30 | 25 | 20 | 15 |
| IV | 24 | 20 | 16 | 12 |

Jobs

 Find the optimum assignment of jobs to machines and the corresponding time.

1. On an average 96 patients arrive in an emergency clinic which works for 24 hours a day. Also on an average a patient requires 10 minutes of active attention. Assume that the facility can handle only one emergency at a time. Suppose that it costs the clinic Rs.100 per patient and each minute of decrease in the average service time of 10 minutes would cost the clinic Rs.10 more per patient. How much would have to be budgeted by the clinic to decrease the average size of the queue to half?

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