



INDIAN INSTITUTE OF MATERIALS MANAGEMENT
Post Graduate Diploma in Materials Management- 3 years
Graduate Diploma in Materials Management
Paper No. 2

July 2019

QUANTITATIVE TECHNIQUES AND OPERATIONS RESEARCH

Date: 21.07.2019

Max .Marks: 100.

Time: 2.00 to 5.00 p.m.

Duration: 3 hours

Instructions:

1. The Question Paper is in two parts- Part A (compulsory) and Part B.
2. From Part A answer all the questions. Each question carries 1 mark, total 25 marks. **(Total Marks 25)**
3. From Part B answer any five questions out of 7 questions .Each question carries **15 marks, total 75 marks.**
4. Use of non-scientific calculator and/or mathematical tables is permitted.
5. Graph paper can be used wherever necessary.

PART A
(Compulsory)

(25 x1 = 25 marks)

Q1. State whether the following statements are true or false: (15 Marks)

- a). Statistics is an aggregate of facts.
- b). Product quality are the features that have a capacity to meet consumer needs.
- c). Facts provided or learned about something or someone.
- d). A source of supply in transportation problem is called as the destination.
- e). Customers balk when they join the queue.
- f). Efficiency is the effectiveness of a machine in transforming energy into force.
- g). FIFO is the common queue discipline.
- h). Scheduling determines an order for processing of jobs on machines.
- i). Service time follows negative exponential distribution.
- j). Certainty means undefined strategies.
- k). Times estimates for an activity follow Normal distribution.
- l). Working capital management is the decision of short term investment.
- m). A node on a network represents an activity.
- n). μ indicates the arrival rate in a waiting line.
- o). A Poisson distribution applies to a variable taking discrete values.

Q2 Fill up blanks

5 marks

- A) Dynamic program is known as----- linear program
- B) Graphs are simple-----
- C) Set of all possible outcome in probability is-----
- D) Gama distribution is----- random variable
- E) Fixed period of review of inventory is----- cycle system

Q3 Abbreviate the following**5 marks**

1. IRR, 2 .PERT, 3. NPV, 4. VMI, 5. VED,

PART B

(Answer any five)

(5 x15 = 75 marks)

Q.4. (A).**(5 Marks)**

A company manufactures four variants of the same product and in the final part of the manufacturing process there are assembly, polishing and packing operations. For each variant the time required for these operations is shown below (in minutes) as is the profit per unit sold.

	Assembly	Polish	Pack	Profit (£)
Variant 1	2	3	2	1.50
2	4	2	3	2.50
3	3	3	2	3.00
4	7	4	5	4.50

Given the current state of the labour force the company estimate that, each year, they have 100000 minutes of assembly time, 50000 minutes of polishing time and 60000 minutes of packing time available. How many of each variant should the company make per year and what is the associated profit? Formulate this as the LPP problem.

Q.4. (B).**(10 Marks)**

A workshop has three (3) types of machines A, B and C; it can manufacture two (2) products 1 and 2, and all products have to go to each machine and each one goes in the same order; First to the machine A, then to B and then to C.

The following table shows:

- The hours needed at each machine, per product unit1
- The total available hours for each machine, per week
- The profit of each product per unit sold.

Type of Machine	Product 1	Product 2	Available hours per week
A	2	2	16
B	1	2	12
C	4	2	28
Profit per unit	1	1.50	

Formulate and solve using the graphical method a Linear Programming model for the previous situation that allows the workshop to obtain maximum gains.

Q.5

(15 Marks)

A company has factories at A, B and C which supply warehouses at D, E and F. Weekly factory capacities are 200, 160 and 90 units respectively. Weekly warehouse requirements (demands) are 180, 120 and 150 units respectively. Unit shipping costs (in Emalangeni) are as follows:

Factory	D	E	F	Capacity
A	16	20	12	200
B	14	8	18	160
C	26	24	16	90
Demand	180	120	150	450

Determine the optimum distribution for this company to minimize shipping costs.

Q.6. Write a brief note on any three of the following

(15 Marks)

- :
- (a) Decision tree
 - (b). Markov Process
 - (c). Simulation
 - (d). Integer programming.
 - (e) Difference between Statistical techniques and Operations Research

Q.7.(A). Explain ABC Classification of Inventory

(7 Marks)

(B). What is payback period? How is it useful in decision making? What are the limitations of payback period?

(8 Marks)

Q.8. The computer lab at State University has a help desk to assist students working on computer spreadsheet assignments. The students patiently form a single line in front of the desk to wait for help. Students are served based on a first-come, first-served priority rule. On average, 15 students per hour arrive at the help desk. Student arrivals are best described using a Poisson distribution. The help desk server can help an average of 20 students per hour, with the service rate being described by an exponential distribution. Calculate the following operating characteristics of the service system: **(15 Marks)**

- (a) The average utilization of the help desk server
- (b) The average number of students in the system
- (c) The average number of students waiting in line
- (d) The average time a student spends in the system
- (e) The average time a student spends waiting in line.

Q.9.

(15 Marks)

Using Simplex Method,

$$\begin{aligned} &\text{Maximize} && p = 2x - 3y + z \\ &\text{subject to} && x + y + z \leq 10 \\ &&& 4x - 3y + z \leq 3 \\ &&& 2x + y - z \leq 10 \\ &&& x \geq 0, y \geq 0, z \geq 0 \end{aligned}$$

Q.10.

Find the value of the game having the following pay-off matrix using the principle of dominance. **(15 Marks)**

		Player B			
		I	II	III	IV
Player A	I	3	5	4	2
	II	5	6	2	4
	III	2	1	4	0
	IV	3	3	5	2
