



RAJARATA UNIVERSITY OF SRI LANKA

FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Information and Communication Technology

Third Year - Semester II Examination – July/August 2020

ICT 3202 – OPERATIONAL RESEARCH

Time: Two (02) hours

- Answer any FOUR (04) questions.
- Calculators are allowed.
- Each question carries equal marks.

1. Using the graphical method solve the following Linear Programming Problems.

Minimize $Z = 40x_1 + 50x_2$

Subject to $2x_1 + x_2 \leq 10$

$x_1 - 2x_2 \leq 0$

$x_1 + x_2 \geq 3$

$2x_1 - x_2 \geq 0$

$x_1, x_2 \geq 0$

(20 marks)

What kind of issue will be arisen if the constraint $2x_1 + x_2 \leq 10$ is changed as $2x_1 + x_2 \geq 10$?

(05 marks)

2. Given below is the unit costs with suppliers S1, S2, S3 and demand D1, D2, D3 and D4.

Supplier	Cost per unit				Availability (supply)
	D1	D2	D3	D4	
S1	16	10	14	12	100
S2	24	18	8	14	90
S3	18	22	20	16	60
Demand	50	64	80	56	250

- a) Find an initial solution using North West Corner method.

(10 marks)

- b) Find the optimum solution for the above problem using MODI (Modified Distribution) method. (10 marks)
- c) What step would you taken if the wholesaler D4 demands 60 units? (05 marks)
3. Machine shop has four machines (M_1 to M_4) available for fabrication of products as per customer specifications. On one occasion, orders have been received for five jobs (J_1 to J_5). Each job requires one machine and no machine can do more than one job. The expected profits in rupee by machine-job combinations are shown in table below.

	J_1	J_2	J_3	J_4	J_5
M_1	75	95	100	110	60
M_2	95	100	75	90	70
M_3	55	75	95	90	100
M_4	105	110	95	85	130

Find the optimal assignment of the jobs to machines.
Which job will not be accepted?

(25 marks)

4. The following table gives the data for the activities of a project.

Activity	A	B	C	D	E	F	G	H	I	J
Immediate predecessor	-	-	A	A	B	D	C	D	E, H	F, G
Time(weeks)	5	4	2	2	6	5	7	8	5	11

- a) Draw the network diagram (10 marks)
- b) Find the critical path. (05 marks)
- c) If activity time of J is changed as 5 weeks what would be the project completion time? (05 marks)
- d) Which activities can be delayed more than two months without affecting the completion time of the project (05 marks)

5. The arrival rate of customers to a bank counter is 15 customers per hour. The service rate of customers in system system is 20 customers per hour. Assuming that customers arrive according to a Poisson distribution and service times according to an exponential distribution. Find the followings.
- a) The utility factor of the system. **(04 marks)**
 - b) The average time a customer spends in the system. **(04 marks)**
 - c) The average number of customers in the system. **(04 marks)**
 - d) The average time a customer spends in the queue waiting for service. **(04 marks)**
 - e) The average number of customers in the queue. **(04 marks)**
 - f) The probability that the system will be idle. **(05 marks)**

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