BSc. Eng. (ME)
Semester: 8th Semester

Date: 21 May 2024
Time: 10:00 am – 01:00 pm

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)

DEPARTMENT OF MECHANICAL AND PRODUCTION ENGINEERING

Semester Final Examination
Course No IPE 4857
Course Title: Operations Research

Summer Semester, A. Y. 2022-2023
Time: 3 Hours
Full Marks: 150

There are 6 (Six) questions. Answer all of them. The symbols have their usual meanings. Marks of each question and corresponding CO and PO are written in the right column. Assume reasonable values if required.

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1. a. Solve the game theory problem as provided in the payoff table below using linear programming method. Here, player A and player B could use three strategies. [20] CO2, PO2, K2

		Player B		
Player A		No Change	Minor Change	Major Change
	No Change	0	-4	-10
	Minor Change	3	0	5
	Major Change	8	1	0

b. People arrive at a Railway station to buy tickets according to Poisson distribution. The service time is 5 minutes and there is only one ticket counter. The Railway station incharge is interested in predicting the operating characteristics of this counter during a typical operating day from 10.00 a.m. to 11.00 a.m. Describe briefly the procedure of analytical simulation to determine the average waiting time before service and average time a person spends in the system. [5] CO2, PO2, K2

2. Goods have to be transported from sources X, Y, and Z to destinations A, B and C. The transportation cost per unit, capacities of the sources, and the requirements of the destinations are given in the table below. Determine a transportation schedule so that cost is minimized. Here, for the initial basic feasible solution use North-West Corner Method and then find optimal solution using UV method considering degeneracy. [25] CO2, PO2, K2

Source/ Destination	A	B	C	*Supply*
X	8	5	6	*120*
Y	15	10	12	*80*
Z	3	9	10	80
Demand	*150*	*80*	*50*	

3. A salesman must travel from city to city to maintain his accounts. This week he has to leave his home base and visit other cities and the return home. The table shows the distances (in km) between the various cities. His home city is city A. Use the assignment method to determine the tour that will minimize the total distance of visiting all cities and then returning home. [25] CO2, PO2, K2

City/ City	A	B	C	D	E
A	--	3.5	3	4	2
B	3.5	--	4	2.5	3
C	3	4	--	4.5	3.5
D	4	2.5	4.5	--	4
E	2	3	3.5	4	--

4. Solve the following linear programming problem using Dual Simplex method [25] CO2, PO2, K2

Minimize $z = 3x_1 + x_2$

Subject to:

$x_1 + x_2 \geq 1$

$2x_1 + 3x_2 \geq 2$

$x_1, x_2 \geq 0.$

5. A mobile manufacturing plant sets two criteria for the selecting a generator for their factory. These two criteria are: Reliability(R), and Maintenance (M). Two generators, one is called X and the other is Y, are suggested by a vendor. The Chief Engineer of the company prefers R three times more important than M. Furthermore, pertaining to R, she prefers X four times more than Y. Pertaining to M, she prefers Y five times more than X. Using Analytical Hierarchy Process (AHP), determine which truck the engineer should select. [25] CO2, PO2, K2

6. HPK Compressor Ltd has to supply the following number of compressors at the end of each month. Production during a month is available for supply at the end of the month. The stock holding cost per month is $ 1 per item. The setup cost is $ 940 per setup. Production capacity per month is sufficient to produce the total required units in a month. The production cost is $ 3 per item. Find the optimal policy of production considering inventory using dynamic programming so that total cost may be minimum. [25] CO3, PO3, K5

Month No.	Month	No. of Compressors
1	January	160
2	February	250
3	March	360
4	April	440
	Total	1210

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