

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF MECHANICAL AND PRODUCTION ENGINEERING

Semester Final Examination
Course Number: Hum 4521
Course Title: Engineering Management

Winter Semester: 2022 - 2023
Full Marks: 150
Time: 3 hours

There are 6 (six) questions. Answer **all** the questions. Marks of each question and the corresponding CO and PO are written in the right column in the brackets. Assume reasonable values if needed.

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- 1 Write short notes on the following topics. Provide simple examples if applicable. (5x5) (CO1) (PO1)
- a) MPS
 - b) Critical Ratio
 - c) Social loafing
 - d) ABC Analysis
 - e) Qualitative forecasting methods
- 2 a) Are 'groups' and 'teams' synonymous? Explain in short. (5) (CO2) (PO2)
- b) What are the major factors that determine group performance and satisfaction? Explain how cohesiveness and level of conflict affect group performance. (10) (CO2) (PO2)
- c) Explain the characteristics associated with an effective work team. (10) (CO2) (PO2)
- 3 a) Sumon Stores sells Tova Jam in his store in New Market. The demands for the item for June, July, August, and September are 720, 740, 790 and 810 units respectively. Forecast the demand of Tova Jam for October using four-month simple moving average and the weighted moving average. Assume weights for the last four month are 1, 2, 3, and 4 respectively for weighted moving average method. (8) (CO2) (PO2)
- b) The demands for a product in each of the last four months are 130, 170, 190 and 230 respectively. Apply exponential smoothing technique with a smoothing constant of 0.3 to generate a forecast for demand in current month. Assume forecast for the 1st month was 125. (7) (CO2) (PO2)
- c) Monthly demand of a product is shown below. Forecast the demand for the month of December using linear regression method. (10) (CO2) (PO2)
- | Month | Jan | Feb. | Mar. | Apr. | May | Jun | Jul. | Aug. | Sep. | Oct. |
|----------|-----|------|------|------|-----|-----|------|------|------|------|
| Quantity | 235 | 256 | 267 | 276 | 278 | 290 | 302 | 305 | 324 | 345 |
4. a) Consider the following layout and patient movements between departments of (15)

1	2	3	4	5	6	7	8	Department
	100	100	0	0	0	0	0	1. Entrance and initial processing room
		0	50	20	0	0	0	2. Examination room 1
			30	30	0	0	0	3. Examination room 2
				20	0	0	20	4. X-ray room
					20	0	10	5. Laboratory tests and EKG room
						30	0	6. Operating room
							0	7. Recovery room
								8. Cast-setting room

Snow-Bird Hospital. Propose an alternative layout and compare with this one. Provide necessary calculations. Distances shown are in feet.

(CO2)
(PO2)

Entrance	Exam Room-1	Exam Room-2	X-Ray	10'
Laboratory	Operating Room	Recovery Room	Cast-setting room	10'
10'	10'	10'	10'	

- b) Sharpening your pencil is an operation that may be divided into eight small elemental motions. In MTM terms each element may be assigned a certain number of TMUs:

(4)
(CO2)
(PO2)

-Reach 4 inches for the pencil	6 TMU
-Grasp the pencil	2 TMU
-Move the pencil 6 inches	10 TMU
-Position the pencil	20 TMU
-Insert the pencil into the sharpener	4 TMU
-Sharpen the pencil	120 TMU
-Disengage the pencil	10 TMU
-Move the pencil 6 inches	10 TMU

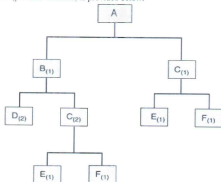
What is the normal time for sharpening one pencil? Convert your answer into minutes and seconds.

- c) ABC Store is famous for its boxed candies, which are sold primarily to businesses after proper gift wrapping. This wrapping task has two elements (A and B) done by two different operators Mr. Monir and Mr. Baker. One analyst recorded the following information: (6)
(CO2)
(PO2)

Task element	Operator	Times Recorded (min)	Performance rating
A	Mr. Monir	2.2, 2.6, 2.2, 2.5, 10, 2.3, 2.4	105%
B	Mr. Baker	1.2, 1.1, 6, 1.3, 1.0, 1.5, 1.2	85%

Based on the above information, calculate average observed time, normal time, and standard time for the gift-wrapping process. Assume an allowance factor of 15%.

5. a) ABC Org., packages high-fidelity components for mail order. Components for the top-of-the line microphone kit, "Glorious" (A), include 1 B and 1 C. A bill of material (product structure) is provided below: (3+5 +
10)
(CO3)
(PO11)



The Lead Time for Glorious Microphone Kits (As) are given as:

Item	Lead time (weeks)
A	1
B	2
C	3
D	1
E	2
F	1

For an order of 50 Glorious Microphone Kits (As) –

Answer the following-

- Redraw the product structure with low-level coding.
- Construct a Time-phased product structure.
- Prepare a gross requirements plan for Glorious Microphone Kits for the given production schedule.

- b) The XYZ company is putting out four new electronic components. Each of XYZ's four plants has the capacity to add one more product to its current line of electronic parts. The unit-manufacturing costs for producing the different parts at the four plants are shown in the accompanying table. How should XYZ assign the new products to the plants to minimize manufacturing costs? (7) (CO3) (PO11)

Electronic Component	Plant			
	1	2	3	4
A	\$0.10	\$0.12	\$0.13	\$0.11
B	0.04	0.06	0.05	0.08
C	0.32	0.40	0.31	0.30
D	0.14	0.17	0.19	0.15

6. a) Five architectural rendering jobs are waiting to be assigned at AB Architects. Their work (processing) times and due dates are given in the following table. The firm wants to determine the sequence of processing according to (i) FCFS, (ii) SPT, (iii) EDD, and (iv) LPT rules. Jobs were assigned a letter in the order they arrived. Today is day 1, and work begins today. (15) (CO3) (PO11)

JOB	JOB WORK (PROCESSING) TIME (DAYS)	JOB DUE DATE (DAYS)
A	6	8
B	2	6
C	8	18
D	3	15
E	9	23

Find out the following measures of effectiveness for (i) FCFS, (ii) SPT, (iii) EDD, and (iv) LPT rules and suggest an optimal solution :

- I. Average completion time
 - II. Utilization metric
 - III. Average number of jobs in the system
 - IV. Average job lateness
- b) Dynamic motors, a car manufacturer uses a part produced in its manufacturing facility in batches and uses at a rate of 100,000 per year. Holding cost per unit per year is \$20, and setup cost per batch is \$100. If the company wishes to produce the parts in economic batches: (10) (CO3) (PO11)
- i) What batch size should the company use?
 - ii) What will be the annual holding and setup cost?
 - iii) How many batches will the manufacturer produce in one year?
 - iv) How much will the annual total inventory cost (holding and setup cost) change if the demand of the part increase or decrease by 50%? Does the result support robustness of EOQ model? Explain.