

Program: B. Sc. Eng. in IPE
Semester: Summer semester

Date: 23 February, 2023
Time: 10:00 am – 11:30 am

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

Mid Semester Examination
Course Number: IPE 4603
Course Title: Manufacturing Planning and Control

Summer Semester: 2021 - 2022
Full Marks: 75
Time: 1.5 Hours

There are 3 (three) questions. Answer all 3 (three) questions.

The symbols have their usual meanings. Marks of each question and corresponding CO and PO are written in the brackets. Assume reasonable value for any missing data.

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1. a) Company "X" for the forthcoming year of 2024 plans to launch 03 (three) new product lines, namely petroleum, watches, and televisions. (10)
Identify the classification or form of MPC for each of the products and briefly mention the key differences between/among those forms. (CO1) (PO1)
- b) "R" electronics company used to sell ready-made complete PCs from the shelf during 2022. But due to poor sales in that period they shifted to a more customer-oriented sales technique. So, in 2023 'R' electronics took orders from the customers and assembled components (RAM, Processor, GPU, HDD etc.) accordingly to produce the PCs. (10)
From the above scenario, identify the two distinct manufacturing environments. Explain whether the switch between the sales techniques/environments was logical in terms of 'inventory cost', 'customer satisfaction', 'delivery lead time' and 'product customization'. (CO1) (PO1)
- c) Enlist different types of "order costs" related to inventory. Briefly explain any one of them. (05)
(CO1) (PO1)
- 2 a) A manufacturing firm during a period of t_1 , produces an item at the rate of k units per period and simultaneously it is consumed at the rate of D units per period. During the next period t_2 , the production of the item is discontinued but the consumption of that item is continued. If the cost per setup of the machine is C_s and the carrying cost is C_c , then derive an expression for the optimum production run/size that minimizes the total inventory cost (Assume, no shortage of inventory). (10)
A toy manufacturer produces rubber wheels for its popular "Toy-truck" series. The following information about the wheels are given: (CO2) (PO2)
The annual demand is 48,000 wheels. The firm produces 800 wheels/day while operating 240 days/year. Inventory holding cost is 1\$/wheel a year and setup cost for a single production run is 45\$.
Determine the optimal production size.

b) The following is the Annual Financial Statement of a departmental store.

Item Name	Annual Usage in units	Unit Cost (\$)
Toy	6000	2
Cookies	7500	0.5
Pencil	4500	1.25
Paste	1500	8
Apple	5000	1.15
Orange	3000	2
Toothbrush	8000	10.5
Grapes	6500	13.5
Water bottle (500 ml)	8000	2.5
KitKat	5000	1.5

(15)
(CO2)
(PO2)

- From the Statement, classify the items as A, B, and C according to annual cost.
- Suggest inventory control systems to be used for A, B, and C class items.
- Construct a chart/graph to summarize the inventory value for each class (percent of total inventory value versus percent of total list of different items).

3 a) The production schedule and the inventory position of Company "Z" Ltd. for a particular week is provided in the following table:

Item	Std. hours/unit	Production lot size (units)	Demand forecast per pd (units/ week)	Current inventory position (units)
A	0.1	100	35	100
B	0.2	150	50	120
C	0.3	100	40	130
D	0.2	200	60	100

(8)
(CO3)
(PO11)

Is there sufficient capacity available; given that weekly period is 100 hrs.? Decide based on ROT (Run Out Time) analysis. Also, provide a priority list for replenishment of items.

b) The "K" Molding company has two alternatives for meeting a customer requirement in the forthcoming year of 2024. If done in-house, the fixed cost would be \$12,000 with variable cost totaling \$1.6 per unit. Alternatively, they can outsource from a local supplier at \$2 per unit. This would require an annual fixed cost of \$2000.

(17)
(CO3)
(PO11)

From the above scenario, answer the following –

- The break-even product quantity based on both alternatives.
- Choose the best alternative for the company if the expected demand is 30,000 units by constructing a graph that represents both demand (units) and cost (\$).
- Should the previously chosen alternative be the same if the expected demand drops to 20,000 units? Explain mathematically.