

KATHMANDU UNIVERSITY
End Semester Examination
July/August, 2024

Level : B.E.
Year : III
Time : 2 hrs. 30mins.

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Course : MEEG 308
Semester : II
F. M. : 55

SECTION "B"
[55 marks]

Attempt ALL questions. Assume any suitable data if required.

1. As per the Paper "Improving product development process design: a method for managing information flows, risks, and iterations" it applied case study lessons, where various Product Design Process design methods were proposed. So explain in detail about the PDP Design Methods discussed in the above mentioned paper. [5]
2. Explain in detail about Production System Lifecycle, discuss various stages in Life Cycle Approach considering an example of a Beverage Industry with specific one product as an example of such industry in complete details. [5]
3. The number of Auto Accidents in a certain region is related to the regional number of registered automobiles in thousands (X_1), alcoholic beverage sale in \$ 10,000 (X_2), and rainfall in inches (X_3). Furthermore, the regression formula has been calculated as: [5]

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3$$

Where Y is the number of automobile accidents

$$a = 7.5, b_1 = 3.5, b_2 = 4.5 \text{ and } b_3 = 2.5$$

Calculate the expected number of automobile accidents under conditions a, b, c:

	X_1	X_2	X_3
(a)	2	3	0
(b)	3	5	1
(c)	4	7	2

4. A manufacturer carries stock of an item with an annual demand of 30,000 units. Although the inventory manager cannot estimate setup cost or holding cost precisely, he feels that the ratio of the two is somewhere between 100 to 1 and 150 to 1; that is, $S/h = 100$ to $S/h = 150$. [5]
 - a. Calculate EOQ on both conditions.
 - b. How sensitive is the optimal Q to the S/h ratio? If S/h doubles or Triples, what happens to Q^* ?
 - c. How sensitive is Q to annual demand? If annual demand doubles or triples, what happens to Q^* ?
5. As per the Case Study "A Quantitative Approach to Site Selection Process" from Industrial Engineering Handbook by Maynard.
 - a. Describe a comprehensive approach for strategically selecting new site for an organization, where it allows the decision makers match the organizations objectives and goals with the financial considerations of a new location in detail.
 - b. Write shortly How AHP (Analytical Hierarchy Process) organizes all of the trade-offs among competing drivers and helps determine a final decision. [7+3]

P.T.O.

6. Two product groups A and B, have product trees as shown in the diagram. In a company producing product of including multiple products,
 Product A = (includes product C and D), Product B = (includes product D and E)
 The process sheets give the sequence of operation for each item, along with the set up time and run time. Also the economic order quantities for these items are given in table as A, 10; B, 15; C, 20; D, 25; and E, 30.

Item	Operation No.	Work Centre	Operation	Set up time (hr)	Run time (hr)
A	0010	1030	Assembly	0	2.0
B	0010	1030	Assembly	0	3.0
C	0010	1012	Milling	0.3	0.14
	0020	1020	Drilling	2.4	0.4
	0030	1012	Milling	2.7	0.23
	0040	1018	Grinding	1.0	0.21
D	0010	1012	Milling	0.4	0.15
	0020	1020	Drilling	2.8	0.35
	0030	1018	Grinding	2.2	0.24
E	0010	1012	Milling	0.3	0.18
	0020	1020	Drilling	2.1	0.39
	0030	1012	Milling	2.5	0.26
	0040	1018	Grinding	1.3	0.23

Assume forecast usage quantities for these new quantities as per the suitability over the six year period from 2014, 2015, 2016, 2017, 2018, and 2019.

Determine the capacity requirement for Milling for two products A and B. And assume an available capacity of 4500 units for five years from 2014 to 2019. [5]

7. Find the sequence that minimizes the total time required in performing the following jobs on three machines in order ABC. Find the Job Idle and Machine Idle time for the following problems. Processing times (in hours) are given in the following table : [5]

Job	1	2	3	4	5
Machine A	8	10	6	7	11
Machine B	5	6	2	3	4
Machine C	4	9	8	6	5

8. As per the Case Study "Scheduling and Inventory Control of Manufacturing Systems" from Industrial Engineering Handbook by Maynard. [3+5+2]
- Discuss the Explosion based Inventory Systems, outlining the essence of Requirement Planning. And how end items are scheduled to be produced in accordance with Master Schedule.
 - How MRPs (Material Requirement Planning) examine assembly relationships between component parts of an End Item to be produced, emphasize it with generation of MRP table with appropriate example.
 - In very short discuss MRP Lot Sizing Heuristics.

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9. The following data's given in a table below represents the completion of Project. The details below contain are the Activities, Immediate Predecessor and Durations of the Project. [5]
- Construct the Critical Path Method Network.
 - Determine the Critical Path and Project Completion Time
 - Compute Early Starts, Early Finish, Latest Start and Latest Finish for all the Activities.
 - Compute the Total Float and Free Floats for all the Non Critical Activities.

Activity	Immediate Predecessors	Estimated Duration (Months)
A	-	2
B	-	5
C	-	4
D	B	5
E	A	7
F	A	3
G	B	3
H	C,D	6
I	C,D	2
J	E	5
K	F,G,H	4
L	F,G,H	3
M	I	12
N	J,K	8

8. Process X has fixed cost of Rs. 40,000 and Variable Cost Rs. 9 per unit whereas process Y has fixed cost of Rs. 16,000 and Variable Cost of Rs. 24 per unit. At what Production Quantity, the total cost of X and Y are equal?
 1200 units 1600 units 2000 units 2400 units

9. A Manufacturer has the following data regarding a product
 Fixed Cost per month = Rs. 50,000, Variable Cost = Rs. 200, Selling Price per unit = Rs. 300, Production Capacity = 1500 units per month
 If the Production is carried out at 80% of the rated capacity that the monthly profit in Rs. is
 12,000 20,000 40,000 70,000

10. Consider the following jobs and their processing times at corresponding machines:

Job	Duration (hrs.)	
	Machine A	Machine B
1	6	3
2	2	7
3	10	8
4	4	9
5	11	5

- 2-4-3-5-1 2-4-5-1-3
 2-3-4-5-1 2-3-4-1-5
11. It represents the process of determining short range capacity requirements.
 Capacity Requirement Planning Aggregate Planning
 Capacity Planning Schedule Planning
12. Which one of the following information combinations has the lowest break- even point?

	Fixed Cost (in Rs.)	Variable Cost/unit (in Rs.)	Revenue / units (in Rs.)
a	30,000	10	40
b	40,000	15	40
c	50,000	20	40
d	60,000	30	40

- a b c d
13. A fabrication section of a department must supply 4000 parts daily to another department for assembly. Processing time is 3 min/unit, and the equipment efficiency for two shifts daily (8*2 hours) is estimated at 80 percent. The equipment requirements for this case will be?
 12 14 10 16
14. In Kelvinator produces refrigerator in batches. How many units in a batch should they produce? In each batch once the production starts they can make 80 units per day. The demand during the production period is 60 units per day. Estimated demand for the year is 10,000 units. Set-up cost of the manufacturing process is 3000 per setup. Carrying cost is Rs. 15 unit per year.
 2000 per lot 1200 per lot 500 per lot 4000 per lot

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15. A store sells 5200 cases of cold drinks per year. The supplies charge Rs. 100 /- per each delivery regardless of how many cases have been ordered. Delivery always occurs the day after ordering and the average carrying cost Rs. 10.40 /- per/ item/ year. Find the number of cases per order.

217 317 417 517

16. A Company uses an Economic Order Quantity (EOQ Model) for Inventory Control. The Annual Demand for their product is 10,000 units, the Ordering Cost per order is Rs. 100, and the holding cost per unit per year is Rs. 2. What is the EOQ for this Product?

1000 units 100 units 400 units 50 units

17. ABC Inventory Control focuses on those

Items not readily available Items which consume less money
 Items which have more demand Items which consume more money

18. Using Johnson Rule find the optimal sequence for the Job:

Jobs	Machine 1 (time)	Machine 2 (time)
A	2	5
B	9	7
C	8	12
D	10	3
E	4	9
F	11	14

AECFBD ABCDEF DBFCEA ADBCEF

19. The amount of time by which an activity can be delayed without affecting project completion time is

Activity Float Total Float Free Float Independent Float

20. In n job and two machines sequencing problems with machine order of processing the jobs is M1M2, let's say M1 and M2 are the two machines

Job having minimum time on the machine M2 is processed in the first
 Job having minimum time on the machine M2 is processed in the last
 Job having minimum time on the machine M1 is processed in the last
 Job having maximum time on the machine M2 is processed in the last

