

MECHANICAL ENGINEERING DEPARTMENT
Motilal Nehru National Institute of Technology Allahabad
END SEMESTER EXAMINATION (2017-18)
Subject: ME-1607: Production and Operation Management
B.Tech. VI Semester (Production and Industrial Engineering)

TIME: 3 Hours

MAX. MARKS: 60

Note: Attempt all questions. Assume any missing data and write clearly.

- (a) For what type of production systems JIT is more suitable and for what type of systems JIT is not suitable? [4]
- (b) Explain two advantages of operating machinery at 80-90% rather than at 98% of capacity. How can it be cost effective to operate at these lower rates? [3]
- (c) What is the primary difference between synchronous production and Little JIT? [3]
- (a) Explain EOQ model. What are the different assumptions of EOQ model. [4]
- (b) A television manufacturer requires 24,000 two-centimeter-long pieces of wire every month for assembly. Ordering costs are estimated at \$42, and the cost of carrying is 25% percent of the unit piece, which is \$0.80. Assuming delivery is instantaneous, find the reorder point and economic order quantity. [6]

A pipeline company wanted to schedule a pipeline construction project that is divided into the 13 activities listed in Table 1. [10]

Table 1: Pipeline company project

Activity	Predecessors	Normal		Crash	
		Time (m)	Cost (\$)	Time (m)	Cost (\$)
A	None	2	250	1.5	300
B	A	4	620	3.0	750
C	B	4	380	2.5	500
D	A	4	220	3.0	280
E	C	5	900	4.0	1150
F	E	6	750	4.5	975
G	E	3	180	3.0	180
H	F	3	340	2.0	450
I	D,F	3	200	2.5	300
J	F,G	5	700	3.5	950
K	H	2	75	1.5	125
L	J	3	160	2.5	240
M	I,K,L	1	60	1.0	60

- (a) Construct a PERT/CPM chart for this project.
- (b) Do a two-pass analysis to determine the earliest time the project will be completed using the normal activity times, and identify the critical path activities.
- (c) Suppose company wanted to completed the project in two months less time than that found in part (b); which activities should it crash and by how much?
- (a) A small electronics company produces pocket calculators and records the demand monthly. The following demand data are for a representative calculator: November, 45; December, 57; January, 60. Using 50 as the first order exponential smoothing forecast for November, forecast February sales. [6]

- (b) Explain the difference between job design and job standards. What are the different parts of effective job design? [4]

A company is setting up an assembly line to produce 192 units per eight-hour shift. The following table identifies the work elements, times and immediate predecessors. [10]

Work Element	Time (seconds)	Immediate Predecessor(s)
A ✓	40	None
B ✓	80	A ✓
C ✓	30	D, E, F
D ✓	25	B
E ✓	20	B
F	15	B
G ✓	120	A ✓
H ✓	145	G ✓
I ✓	130	H
J	115	C, I

- (a) What is the desired cycle time?
 (b) What is the theoretical minimum number of stations?
 (c) Use the largest work-element time rule to work out a solution, and show your solution on a precedence diagram.
 (d) What are the efficiency and balance delay of the solution found?

- (a) A manufacturer has the following information on its major product: [6]
 Regular-time production capacity = 2,600 units/period
 Overtime production cost = \$12/unit
 Inventory costs = \$2/unit/period (based on ending inventory)
 Backlog costs = \$5/unit/period
 Beginning inventory = 400 units
 Demand (in units) for periods 1,2,3,4 is 4000, 3200, 2000 and 2800 respectively.
 Develop a level output plan that yields zero inventory at the end of period 4. What costs result from this plan.

- (a) What are the examination categories for the Malcolm Baldrige Quality Award. Explain in brief. [2]
 (c) Distinguish between design capacity and system capacity. Explain different capacity expansion strategies with their advantages and disadvantages. [2]