17-Ind-A4, Production Management

3 hours duration

Notes:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit, with the answer paper, a clear statement of any assumptions made.

2. This is a Closed Book exam. Candidates may use one of two calculators, the Casio or Sharp approved models.

3. Do two questions from section A, and three questions from section B. Five questions constitute a complete paper. Only the first five questions as they appear in your answer book will be marked.

4. All questions are equally weighted.

5. Write your answers in point-form whenever possible.

6. Please read the questions carefully, and answer what is asked.

Marking Scheme

	a.	b.	c.	d.
Section A				
1.	10	10		
2.	5	5	5	5
3.	10	5	5	
Section B				
4.	10	10		
5.	10	10		
6.	10	10		
7.	10	10		

**National Technical Examinations Dec 2019
17-Ind-A4, Production Management**

Section A

Answer two questions from this section.

1. There are many useful concepts in just-in-time production.
   a. Give a definition of JIT, and list seven of the fundamental concepts.
   b. Give an example of a situation in which JIT will **not** work well and explain why.

2. Define the following terms.
   a. Yo-i-don/andon.
   b. Poka yoke.
   c. SMED.
   d. TPM.

3. A small manufacturer produces a highly customized computer. The production is done in three stages: kitting, case customization and assembly. At the kitting stage, all the components for an order are picked and put into an "internals" bin. The kit for the custom case is created and put in a "case" bin. During case customization, the "case" bin is retrieved, special graphics are printed on the case, a power supply and cooling system are partially assembled into the case, and it is returned to the "case" bin. During assembly, the "internals" and "case" bins are retrieved, and all components are assembled and installed in the case.
   a. Draw a process chart for the above situation.
   b. Revise the chart to improve the process – explain your changes.
   c. Explain how your new process will reduce waste.

Section B

Answer three questions from this section.

4. A small manufacturer of summer lawn games experiences unusual demand patterns during the year, especially leading up to the summer months. From September to February, demand is very predictable and usually about 350 each month, but every year, from March to August, demand is highly variable by month, but follows a predictable pattern. In June, July and August, production, setup and holding costs change because of summer vacations and the use of temporary workers and overtime. The operations manager has created the following table to summarize the situation. At the end of February, inventory is zero. In each month you can choose to produce for that or future months, with one setup. Demand in each month must be met in that month.

Month	March	April	May	June	July	August
Demand	3000	1500	500	300	800	2000
Production cost/unit	50	50	50	50	60	60
Setup cost	2000	2000	2000	2000	3000	3000
Holding cost/unit/month	1	1	1	2	2	2

a. Using an appropriate algorithm, determine the best production quantities in each month from March to August.

b. Will the result change if quarterly, weekly or daily planning periods were used? Explain (do not calculate).

5. Your company introduced a new toy in December 2018. Initial sales were slow, but after starting online sales in February 2019, the monthly total sales were as in the table below. It is October 10, and your manager would like to determine how much of the toy to order for November and December. As of October 10, all pending online orders have been shipped, the current inventory is 685.

Month	Sales
February	450
March	500
April	600
May	750
June	1000
July	1020
August	1030
September	1030

a. Develop order quantities for the remainder of October, and the months of November and December using appropriate methods.

b. Explain your choice of methods and discuss the accuracy of the results obtained.

6. A clothing manufacturer is upgrading their production machinery. The company operates three eight-hour shifts per day; they would like to minimize down-time during the upgrade.

	Activity	Precedes	Duration (hours)
A	Order and receive new machines P and Q	B	480
B	Stop production	C, G, H	2
C	Remove old machine Q	D	2
D	Prepare machine base for Q	E	8
E	Install new machine Q	F	2
F	Test and commission machine Q	L	3
G	Remove old machine P	H	1
H	Prepare new electrical feed for P	J, L	5
J	Install new machine P	K	2
K	Commission and test machine P	L	12
L	Start production		1

a. How much production down-time is needed for this project?
b. Using your knowledge of production systems, revise the project precedence to minimize the production down-time. Justify your answer.

7. A small manufacturer of circuit boards must process several jobs through their facility. Three machines with different capabilities are available (Machines A, B and C). Jobs are not interchangeable between machines. Each job is a batch. The allocation of jobs to machines is given below. All times are in seconds. Your manager has asked that the jobs be completed by a 4-hour deadline, but if not, they must be completed such that the average lateness is minimized.
   a. Sequence the jobs to meet your manager's expectations. **Justify your method.**
   b. Each machine requires a full-time operator. For the proposed schedule in part "a." above, the factory operates three, 8-hour shifts per day, seven days per week. Employees are allowed a minimum of two weekends off in every five weeks, work no more than one shift per day, and must have two days-off in every seven days. Calculate the minimum workforce required for this factory.

Job number	Batch size	Machine times		
		Machine A	Machine B	Machine C
B2401	72	3200		
B7902	126	4400		
B6103	45		6000	
B1104	110	3800		
B9405	240			3800
B4006	32		4300	
B1807	32		4300	
B6208	32		4300	
B9909	192			1800
B1910	64		1200	
B3311	64		1200	
B8212	32		2900	
B4813	64		1000	
B7214	64		1000	
Total time:		11400	26200	5600