

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. 請以生產管理的角度敘述第一次工業革命、第二次工業革命、以及第三次工業革命的重要內涵與意義。(25 分)
2. 請以製造系統的角度敘述工業 4.0 的重要內容與與核心價值。(25 分)

3. (20%) Six jobs will be processed through two work centers sequentially (i.e., work center 1 first and then work center 2) based on a flow-shop system. The processing and order information is detail in the following table. The scheduling rule aims to minimize the total completion time for these six jobs.

Job	Operation time		Due Date
	Work Center 1	Work Center 2	
A	8	2	40
B	16	10	35
C	6	13	20
D	11	9	40
E	13	8	20
F	10	4	35

- (a) (6%) Determine a sequence that will minimize the total completion time for these six jobs.
- (b) (4%) Compute the makespan of completing these six jobs.
- (c) (6%) What is the average tardiness?
- (d) (4%) What is the idle time of each work center?

4. (22%) Consider an assembly line. The information is detailed in the following table. The assembly line works eight-hour a workday and requires to output 24 units per day.

Task	Predecessor	Task time (min)
A	—	12
B	—	15
C	A	10
D	B	7
E	C	10
F	C	8
G	E	12
H	D, F, G	9
I	H	7

- (a) (4%) What is the cycle time?
- (b) (4%) What is the minimum number of workstations required?
- (c) (6%) Apply “ranked positional weight” rule to assign tasks to workstations.
- (d) (4%) From (c), what is the line efficiency?
- (e) (4%) Please provide a suggestion to improve the efficiency and show us it is possible.
5. (8%) Compute the capability of each process and determine which of these three processes are capable. Use 1.33 as the standard of capable index. The information is detailed in the following table.

Process	Mean	Standard Deviation	Lower Spec	Upper Spec
1	7.5	0.09	7	8
2	6.0	0.15	5.5	6.7
3	4.8	0.10	4.6	5.0