Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech(IEM)/SEM-1/IEM-102/2009-10

2009

MANUFACTURING SYSTEMS ENGINEERING

Time Allotted : 3 Hours Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer any *five* questions. 5 × 14 = 70

1. Write notes on any *two* of the following : 2 × 7 = 14
   a) Job evaluation
   b) Job change over / set up and SMED
   c) OPITZ and MICLASS system in Group Technology
   d) Quantitative analysis of the interrelationship between productivity and profitability.
2. a) Describe the procedure in detail in the context of Value Engineering and what are the objectives of Value Analysis. 7
   b) Illustrate various kinds of productivity measurement and the methods of improve productivity. 7
3. a) Describe the 'Rowan' and 'Halsey-Weir' system for determining incentive amount in a manufacturing set-up. Compute the amount payable based on each scheme using following data : 8

   The allowed time is 17 minutes per unit and 200 units were produced in a 40 hour work week. The guaranteed rate is Rs. 40 per hour.
   b) How does a performance based incentive scheme can be developed and how can it be extended to a multitier incentive scheme ? 6

4. a) Describe the process of 'Cell Formation' using the concept of 'composite component' in Group Technology. 7

   b) Show with a diagram the material movement path in 'product layout' and in 'process layout'. Also state the advantages of each of them. 7

5. a) When is flexible manufacturing system selected ? 3

   b) Develop a layout diagram for a flexible manufacturing system comprising of Two CNC Turning Centre, One Milling Centre, One CNC Wire-cut EDM, Two AGVs, One Robotic Manipulator, AS/RS and illustrate the functioning of the system. 6

   c) What are the considerations of locating a large Flexible Manufacturing Facility ? 5

6. a) Allocate the operations optimally in six work stations using 'Ranked Positional Weighted Technique' considering the following data : 9

Operation	*Processing Time*	*Following operation*
01	19	02, 10, 13, 14, 15
02	41	10, 13, 14, 15
03	24	09, 10, 13, 14, 15
04	31	05, 11, 12, 13, 14, 15
05	33	11, 12, 13, 14, 15
06	21	07, 11, 12, 14, 15
07	37	11, 12, 14, 15
08	43	11, 12, 14, 15
09	21	10, 13, 14, 15
10	22	13, 14, 15
11	22	12, 14, 15
12	21	14, 15
13	89	14, 15
14	20	15
15	63	—

b) How can increasing product demand be met by interfering its assembly line ? 5

7. a) Describe the steps in 'Method Study' and how does it help in increasing productivity. 7

b) From the following data, determine the 'Standard Time' of a given task broken in four elements. Observed time is presented in minutes for three observation cycles and the performance rating is placed in parantheses along with each such observation. Allowances for personal and relaxation is 18% and for element-2 a contingency allowance of 2% needs to be considered : 7

Observed time (in Minutes)

Work Elements		*Cycle - 1*	*Cycle - 2*	*Cycle - 3*
i)	Pick-up component from Bin and clamp it in work-fixture	0·15 (70)	0·16 (70)	0·18 (65)
ii)	Carry out Assembly Work	0·40 (80)	0·45 (75)	0·42 (80)
iii)	Unload it on conveyor	0·07 (90)	0·06 (100)	0·07 (100)
iv)	Replace 'Bin' Containing 50 Assembly Kits	5·50 (60)	6·00 (55)	5·00 (70)

8. a) Discuss the usefulness of Ratio-Delay method in manufacturing operations. 3

b) From the following data, determine the 'Standard Time' of assembly operation in an engineering production environment. The observations have been carried out on three production operators : 8

Total production is 2000 units. Allowances to be considered is 20%.

		Production Operator		
		1	2	3
i)	Duration of observation (Hours)	50	45	48
ii)	Total number of observations	1000	950	980
iii)	Number of observation showing assembly operation	300	280	290
iv)	Overall Performance Rating	80%	75%	80%

c) What should be the number of observations for a precision of ± (plus or minus) 5% at 95% confidence level. 3