Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech(IEM)/SEM-1/IEM-102/2012-13

2012

MANUFACTURING SYSTEM 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. a) Show with an appropriate diagram as to how 'Load-distance' optimality analysis is carried out in a process layout study. 7

b) Discuss the advantages and disadvantages of 'product layout' and 'process layout' describing the above types and the hybrid layout. 7

2. a) Allocate the operations optimally, using 'Rank Positional Weight' Technique, in seven work stations considering the following data : 9

Operation	*Following Operation(s)*
01	02, 11, 14, 15, 16
02	11, 14, 15, 16
03	10, 11, 14, 15, 16
04	10, 11, 14, 15, 16
05	06, 12, 13, 14, 15, 16
06	12, 13, 14, 15, 16
07	08, 12, 13, 15, 16
08	12, 13, 15, 16
09	12, 13, 15, 16
10	11, 14, 15, 16
11	14, 15, 16
12	13, 15, 16
13	15, 16
14	15, 16
15	16
16	—

The processing times for the operations are 12, 26, 14, 54, 18, 20, 13, 22, 27, 13, 13, 13, 13, 52, 13, 38 respectively.

b) There are four work centres '*A*', '*B*', '*C*' & '*D*' along a conveyorised production line. '*A*' comprises 3 machines, each can process a job in 35 minutes, '*B*' comprises 4 machines each can process a job in 72 minutes, '*C*' comprises 2 machines, each can process a job 30 minutes and '*D*' is a single machine station that can process a job in 14 minutes. Find the capacity of the production line per week of 45 work hours. Also determine the utilisation of the above four work centres. 5

3. a) Elucidate the technical methods to improve produtivity under appropriate calegories. 7

   b) What is the importance of QCD, the three critical performance factors, for a manufacturing organisation. 4

   c) How is PMTS used for the purpose of work measurement ? 3

4. a) Determine the 'Standard Time' from the following data of a given task broken into six elements. Observed time is presented (in minutes) for three observation cycles and the performance rating is shown in parentheses along with each such observation. Allowance for personal and relaxation need is 17% and for elements (iii), (iv) and (v) a contingency allowance of 2% needs to be consideved. 7

		Observed Time and Performance Rating		
	Work Elements	***Cycle-1***	***Cycle-2***	***Cycle-3***
i)	P/U component from pallet trolley and set in work fixture	0·18 (75)	0·21 (70)	0·19 (75)
ii)	P/U Assy. Kit from Bin	0·23 (85)	0·27 (75)	0·30 (70)
iii)	Carry out sub-assy-1	0·21 (80)	0·23 (75)	0·22 (75)
iv)	Carry out sub-assy-2	0·23 (85)	0·25 (80)	0·27 (75)
v)	Carry out complete Assy.	0·34 (75)	0·35 (75)	0·39 (70)
vi)	U/L Assy on conveyor	0·05 (80)	0·06 (75)	0·05 (80)

   b) Describe the steps of 'Method Study' in detail. 7

5. a) In a 45 hours work week the operator products 225 units of a product. The allowed time per unit is 16·9 minutes. Considering hourly wage as Rs. 80, find the earnings under 'Rowan' and 'Halsey-Weir' incentive system. 7

   b) Describe the 'Value Engineering' procedure. 7

6. a) Elucidate on 'Group Technology Approch' and its role in 'Manufacturing Cell Formation'. 7

   b) Illustrate the 'Value Stream Mapping' in the context of lean manufacturing. 7

7. a) Illustrate with a chart the ranking method in selection of facility location detailing with the factors that affect location decisions. 7

   b) Determine 'Standard Time' of 'Assembly operation', from the following data, in an engineering manufacturing unit. The observations have been carried out on three production operators. Total production during the course of study has been 2000 units. Allowances for 'Assembly' job to be provided as

      i) Personal & Rest as 19%

      ii) Contingency and interference as 4%. 7

		Production Operator		
		I	***II***	***III***
i)	Duration of observation (in hours)	48	47	48
ii)	Total No. of observations	90	86	90
iii)	No. of observations showing assembly operation	36	32	39
iv)	Overall Performance Rating	70%	75%	70%

8. Write short notes on any *two* from the following : 2 × 7

   a) Ergonomic Work Place Layout

   b) Flexibility in Manufacturing Systems

   c) Group Technology and Coding.