BME-035

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

Term-End Examination

00885

December, 2014

BME-035 : INDUSTRIAL ENGINEERING AND OPERATIONS RESEARCH

Time : 3 hours   *Maximum Marks : 70*

Note :

(i)   *Answer any **seven** questions.*

(ii)   *Use of calculators is allowed.*

(iii) *Assume missing data if any.*

1. (a) Explain simplification, diversification and standardisation in the context of product development.   5

    (b) A manufacturing concern was producing 120 locomotives per year by employing 20,000 men in the past. To increase production they now recruited 1,000 men more and as a result production has increased to 140 locomotives per year. Find   5

         (i) What was the labour productivity previously ?

(ii) What is the labour productivity now ?

(iii) What is the percentage increase in production and productivity ?

2. Describe the various recording techniques used in method study. *10*

3. A job consists of four work elements and all are performed by same operator. An analyst conducted work sampling to determine the standard time for the job. The duration of the study is one day with two shifts. Each shift has effective 420 minutes. The details of observations are summarized in the following table. The total number of acceptable units produced during study period is 225. Determine the standard time by assuming allowance of 12%. *10*

Work element number	Frequency of performance	Performance rating
1	50	90%
2	90	150%
3	75	100%
4	85	115%

4. (a) What is product mix flexibility ? Why is it important ? *5*

   (b) Define design for environment (DFE). Distinguish it from design for sustainability (DFS). *5*

5. What do you understand by ergonomic design of products ? Discuss the various design aspects. *10*

6. (a) What do you mean by alternative optima and degeneracy in LPP ? *3*

(b) Solve the following LPP by the simplex method : *7*

Maximize : $z = 3x_1 + 4x_2$

Subject to : $x_1 + x_2 \leq 450$

$2x_1 + x_2 \leq 600$

$x_1, x_2 \geq 0$

7. Four different jobs can be done on four different machines. The set-up and take-down time costs are assumed to be prohibitively high for changeovers. The matrix below gives the cost in rupees of producing job J on machine M.

		Machines			
		M_1	M_2	M_3	M_4
Jobs	J_1	5	7	11	6
	J_2	8	5	9	6
	J_3	4	7	10	7
	J_4	10	4	8	3

How should the jobs be assigned to the various machines so that the total cost is minimized ? *10*

8. Reduce the following game by dominances and find the value of the game. *10*

<center>Player B</center>

		I	II	III	IV
Player A	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

9. Write short notes on any *four* of the following :

$$4\times2\frac{1}{2}=10$$

(a) Value analysis

(b) System reliability

(c) Therbligs

(d) Concurrent design

(e) Saddle point

(f) Analytical Hierarchy Process (AHP)