

**BACHELOR OF TECHNOLOGY IN  
MECHANICAL ENGINEERING  
(COMPUTER INTEGRATED  
MANUFACTURING) 01470**

**Term-End Examination  
June, 2012**

**BME-035 : INDUSTRIAL ENGINEERING &  
OPERATIONS RESEARCH**

*Time : 3 hours*

*Maximum Marks : 70*

---

*Note : Answer seven questions. First question is compulsory.  
Attempt any six of remaining eight . Use of calculator  
is allowed.*

---

1. Select the correct alternative : 10x1=10
- (a) Therbligs are introduced by :
- (i) Gilbreth                      (ii) FW Taylor  
(iii) Adam Smith              (iv) LHC Tippet
- (b) The allowances, are added to \_\_\_\_\_  
to get standard, time.
- (i) Basic time                      (ii) Observed time  
(iii) Normal time                (iv) Any time
- (c) In a process chart, the symbol 'circle' is used  
for :
- (i) Delay                              (ii) Operation  
(iii) Storage                        (iv) Inspection

- (d) We use the vowels A, E, I, O, U and X in a REL chart. The vowel 'E' stands for :
- (i) Evaluation
  - (ii) Examination
  - (iii) Ego needs
  - (iv) Essential
- (e) If primal problem yields an infeasible solution, its dual yields \_\_\_\_\_.
- (i) Unique solution
  - (ii) Multiple solution
  - (iii) Unbounded solution
  - (iv) Infeasible solution
- (f) The IBFS of \_\_\_\_\_ method is independent of costs or profits.
- (i) North West Corner
  - (ii) Vogel's Approximation
  - (iii) Matrix Minima
  - (iv) Row Minima
- (g) A Transportation Problem is said to be balanced if :
- (i) Number of Rows = No. of columns
  - (ii) Total availabilities = Total Requirement
  - (iii) Allocated cells = Rows + columns - 1
  - (iv) The TP matrix is a unit matrix
- (h) The Assignment problem is solved by Hungarian Technique by calculating :
- (i) Operating cost
  - (ii) Maintenance cost
  - (iii) Opportunity cost
  - (iv) Overheads cost

- (i) The game is said to be fair if the value of the game is equal to :
- (i) One                      (ii) Zero  
(iii) Infinity              (iv) Half
- (j) Join of any two points in a space, if contains all the points of line with in the space, then the set or space is called :
- (i) Concave set      (ii) Convex set  
(iii) Logarithmic set (iv) Exponential set
2. (a) Describe various methodologies used for measurement of productivity. 10  
(b) What is technology transfer ? What are its benefits ?
3. Explain the procedure of METHOD study 'SREDIM'. 10
4. An operator was kept under observation for 10 days. In 250 observations, he was found to be on job for 200 times and idle for 50 times. He produced 200 jobs during the 10 days at a performance rate of 120. If the observation period is 5 hours only per day and 15% allowance are given, find the normal time and standard time. 10

5. (a) Distinguish between line Batch and project productions. 10
- (b) Explain the terms :
- (i) Re-engineering
- (ii) Reverse Engineering
- (iii) Concurrent Engineering.

6. Solve following Linear Programming Problem using Simplex Method : 10

$$\text{Max } Z = 3x_1 + 5x_2$$

subject to :

$$x_1 \leq 4$$

$$x_2 \leq 6$$

$$3x_1 + 2x_2 \leq 18$$

$$x_1, x_2 \geq 0$$

7. Maximize the following Transportation Matrix : 10

Markets :	M <sub>1</sub>	M <sub>2</sub>	M <sub>3</sub>	Stock
G <sub>1</sub>	4	4	9	25
G <sub>2</sub>	3	5	8	20
Sales	18	16	11	

8. Find the optimal Assignment :

10

	1	2	3	4	5
A	11	17	8	16	20
B	9	7	12	6	15
C	13	16	15	12	16
D	21	24	17	28	26
E	14	10	12	11	15

9. Solve the following game graphically :

10

		B			
		B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>
A	A <sub>1</sub>	-6	0	6	-3/2
	A <sub>2</sub>	7	-3	-8	2

---