Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (AUE)/SEM-7/AUE-702/2012-13

2012

OPERATIONS RESEARCH & INDUSTRIAL MANAGEMENT

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.

Graph sheet (s) will be supplied by the Institute on demand.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) Manufacturing of daily used commodities are example of
      a) batch production b) mass production
      c) job production d) none of these.

   ii) Simulation is a process of developing
      a) models
      b) rapid prototyping technique
      c) machining operations
      d) any of these.

   iii) When products are manufactured internally in an organization, then holding is also known as
      a) carrying cost b) setup cost
      c) ordering cost d) EOQ.

iv) Reneging is associated with

a) waiting line theory b) inventory management

c) MRP d) LPP.

v) For a 25% increase in order quantity in classical EOQ model, the total relevant cost would be

a) decreased by 2·5% b) decreased by 0·25%

c) increased by 2·5% d) increased by 1·025%

vi) The arrival time in a queuing model can have

a) Poisson distribution

b) Exponential distribution

c) Erlang distribution

d) All of these.

vii) Which of the following is not associated with LPP ?

a) Proportionality b) Uncertainty

c) Additivity d) Divisibility.

viii) Fulkerson's rule is used for

a) determining optimal project completion time

b) job scheduling

c) productivity improvement

d) numbering events.

ix) Fibonacci method is used in

a) queuing models

b) random number generation

c) financial management

d) value analysis.

x) An arrow of CPM and PERT network shows

a) activity b) events

c) any of these d) none of these.

xi) If a basic feasible solution of transportation problem with m origins and n destinations has fewer than $m + n - 1$ positive occupied cells, then the problem is said to be

a) optimal b) pseudo-optimal

c) degenerate d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Find out the maximum stock level for a gear manufacturing company from the following information : reorder level = 32000 units, reorder quantity = 30000 units, minimum consumption = 3000 units per month, minimum reorder period = 2 months.

3. How a transportation problem can be treated as a special case of assignment problem ?

4. Explain with particular reference to the industrial revolution in England the growth and the need for the study of Industrial Management.

5. Draw a large diagram of the Leadership matrix. Mark the two axes on a 1 to 9 scale and label the two axes.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

6. a) A firm manufactures two products *A* and *B*, both of which have to be processed on two machines M_1 and M_2. Product *A* requires 4 hours each on both the machines, while product *B* requires 6 hours on machine M_1 and 2 hours on machine M_2. The available hours on machines M_1 and M_2 are 24 and 16 respectively. The profit per unit is estimated at Rs. 100 for product *A* and Rs. 125 for product *B*. What quantity of each product is produced to maximize profit ? Use graphical method. 5

b) Solve the following linear programming problem using Two-Phase Method. 10

Minimize $Z = x_1 + x_2$

Subject to, $2x_1 + x_2 \geq 4$

$x_1 + 7x_2 \geq 7$

$x_1,\ x_2 \geq 0$

7. a) Differentialte between Big-M and Two-Phase methods ? 2

b) Define exchange ratio, slack variable, surplus variable and artificial variable in the context of LPP. 4

c) A small project is composed of 7 activities whose time estimates listed in the following table. Activities are identified by their beginning (i) and ending (j) node numbers.

Activity (i to j)	Expected duration in weeks		
	Optimistic time	Most likely time	Pessimistic time
1-2	1	1	7
1-3	1	4	7
1-4	2	2	6
2-5	1	1	1
3-5	2	5	14
4-5	2	5	8
5-6	3	6	15

i) Draw the network of the activities in the project. 2

ii) Find the critical path of this project. 2

iii) What is the expected project length ? 2

iv) Calculate the variance and standard deviation of the project length. What is the probability that the project will be completed at the 4 weeks earlier than expected time ? 3

Use the following table :

Z	0·50	0·67	1·00	1·33	2·00
Probability	0·308	0·251	0·158	0·091	0·022

8. a) Use graphical method to solve the following game theory problem and find the value of the game. Aslo suggest the optimal strategies for player *A*.

Player A_1	Player A_2		
	A_{21}	A_{22}	A_{23}
A_{11}	1	3	11
A_{12}	8	5	2

b) Define the following queuing model :

{ (M/M/1) : (∞/FCFS) }

c) An automobile company manufactures around 200 cars per day. Depending upon the availability of raw materials and other conditions, the daily production has been varying between 196 to 204 cars, whose probability distribution is given below :

Production / day	196	197	198	199	200	201	202	203	204
Probability	0·05	0·09	0·14	0·16	0·23	0·12	0·11	0·04	0·06

The finished cars are transported in specially designed three storied lorry that can accommodate a maximum number of 200 cars. Simulate the process to find out the following :

i) What will be the average number of cars waiting in the factory ?

ii) What will be the average number of empty spaces on the lorry ? 5 + 3 + (4 + 3)

9. a) State the different functions of purchase and sales department.

   b) What is leadership ? Explain leadership grid.

   c) What are the different properties of a linear programming problem ? Explain briefly.

   d) Describe how ABC and VED inventory control techniques differ from each other.

   e) Explain Fulkerson's rule. 3 + 3 + 3 + 3 + 3