Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(EE)/SEM-8/EE-802D/2012

2012

PROJECT MANAGEMENT & OPERATIONS RESEARCH

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 Institution on demand.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

$10 \times 1 = 10$

i) The number of basic feasible solutions of a transportation problem with m origins and n destinations is

a) $m + n - 1$ b) $m + n + 1$

c) $m + n$ d) mn.

ii) In an assignment problem involving 4 workers and 3 jobs, the total number of assignments possible is

a) 4 b) 3

c) 7 d) 12.

iii) If the dual has an unbounded solution, then the primal has

a) an unbounded solution

b) no feasible solution

c) a feasible solution

d) none of these.

iv) An activity (i, j) is called Critical Activity, if

a) $E_i = L_j$ b) $E_j = L_i$

c) $E_j = L_j$ d) $E_j - E_i = L_j - L_i = D_{ij}$.

v) When maximum and minimum values of the game are same, then

a) there is a saddle point

b) solution does not exist

c) strategies are mixed

d) none of these.

vi) Multiple serves may be

a) in parallel

b) in series

c) in combination of parallel and series

d) none of these.

vii) A mixed strategy game can be solved by

a) matrix method b) algebraic method

c) graphical method d) none of these.

viii) If there is no common region in the graphical method, then the LPP has

a) unbounded solution b) infeasible solution

c) many solutions d) none of these.

ix) Dijkstra's algorithm is used to find out the shortest path between
   a) any two nodes and any other nodes
   b) the source node and any other nodes
   c) any pair of nodes of unidirectional network
   d) none of these.

x) The role of the artificial variables in simplex method is
   a) to aid in finding the initial basic feasible solution
   b) to start phase of simplex table
   c) to find shadow price for the final simplex table
   d) none of these.

xi) Queuing theory deals with the problems of
   a) material handling
   b) reduction of waiting time or idle time
   c) better utilization of man services
   d) effective use of machines
   e) none of these.

xii) The relation between average waiting time in the system (W_s) and the average waiting time in queue (W_q) is given by

   a) $W_q = \mu W_s$ b) $W_q = \frac{1}{\mu} W_s$

   c) $W_q = W_s + \frac{1}{\mu}$ d) $W_q = W_s - \frac{1}{\mu}$.

xiii) In critical path computation, forward pass determines
   a) earliest occurrence time of events
   b) duration of activity
   c) latest occurrence time of events
   d) all of these.

xiv) The no. of variables in dual is equal to
   a) no. of constraints in dual
   b) no. of variables in primal
   c) no. of constraints in primal
   d) none of these.

GROUP – B

(Short Answer Type Questions)

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

2. Find the dual of the following L.P.P. :

   Maximize $Z = 2x_1 + 3x_2$

   subject to $3x_1 + x_2 \leq 2$

   $-4x_1 + 3x_2 \geq 4$

   $x_1, x_2 \geq 0$

3. Solve the following L.P.P. by graphical method :

   Maximize $Z = 5x + 8y$

   subject to $3x + 2y \leq 36$

   $x + 2y \leq 20$

   $x,\ y \geq 0$

4. A company makes two types of leather belts *A* and *B*. Their respective unit profits are Rs. 4 and Rs. 3. One belt of type *A* requires 2 hours and type *B* requires 1 hour of time in making. The total man-hours available are 1000 per day. Due to insufficient supply of leather, the company can make only 800 belts per day. Only 400 buckles for type *A* and 700 buckles for type *B* are available. Formulate the problem as an L.P.P. and solve it graphically.

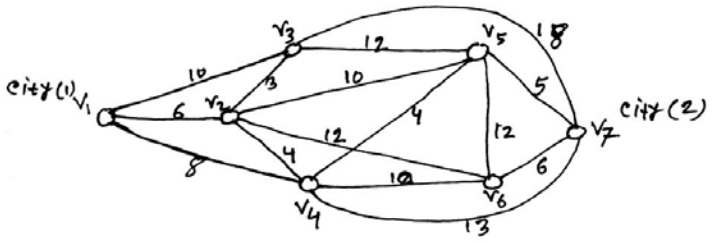
5. State any five applications of operations research.

GROUP – C

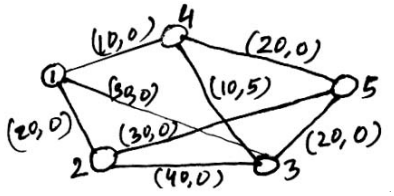
(Long Answer Type Questions)

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

6. a) Find the shortest route between city (1) to city (2).



b) Find the maximum flow in the network.



8 + 7

7. a) Solve the transportation problem and checking the optimality, find the optimal solution :

	D_1	D_2	D_3	D_4	Supply
O_1	1	2	3	4	6
O_2	4	3	2	0	8
O_3	0	2	2	1	10
Demand	4	6	8	6	

b) Solve the assignment problem :

D_1	D_2	D_3	D_4	D_5	D_6
A	6	5	8	11	16
B	1	13	16	1	10
C	16	11	8	8	8
D	9	14	12	10	16
E	10	13	11	8	16

8 + 7

8. a) Write short notes on any *two* of the following : 2 × 5

i) Risk associated with projects

ii) Queuing models

iii) Project feasibility study.

b) What are the costs associated with inventory ? Distinguish between deterministic and stochastic models in inventory theory. 5

9. a) Solve the L.P.P. by simplex method :

Minimize $Z = 3x_1 + 5x_2$

subject to $x_1 + 2x_2 \geq 8$

$3x_1 + 2x_2 \geq 12$

$5x_1 + 6x_2 \leq 60$

$x_1, x_2 \geq 0$

b) What is meant by inventory ? What are the main objectives of an inventory model ? 10 + 5

10. a) A automobile company manufactures around 150 scooters. The daily production varies from 146 to 154 depending upon the availability of raw materials and other working conditions :

Production (per day)	146	147	148	149	150	151	152	153	154
Probability	0·04	0·09	0·12	0·14	0·11	0·10	0·20	0·12	0·08

The finished scooters are transported in a specially arranged truck accommodating 150 scooters.

Using the following random numbers :

80, 81, 76, 75, 64, 43, 18, 26, 10, 12, 65, 68, 69, 61, 57

simulate the process to find out :

i) what will be the average number of scooters waiting in the factory ?

ii) what will be the average number of empty space on the truck ?

b) A salesman has to visit five cities *A, B, C, D* and *E*. The distances (in hundred kilometres) between the five cities are as follows. Which route should be selected so that the total distance travelled is minimum ?

	A	*B*	*C*	*D*	*E*
A	—	4	7	3	4
B	4	—	6	3	4
C	7	6	—	7	5
D	3	3	7	—	7
E	4	4	5	7	—

8 + 7

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