

**FACULTY OF MANAGEMENT****M.B.A. II-Semester Examination, July / August 2015****Subject : Operations Research****Course No : 2.5****Time : 3 Hours****Max. Marks: 80****Note: Answer ALL the questions.****Part – A (10x2=20 Marks)**  
**(Short Answer Type)**

- 1 Write short notes on the following.
  - (a) Goal Programming
  - (b) Initial basic feasible solution
  - (c) Relationship between primal and dual in LPP
  - (d) Sensitivity analysis
  - (e) Closed loop in transportation problem
  - (f) Multiple optimal solutions in assignment problems
  - (g) Critical path in network analysis
  - (h) Spanning tree
  - (i) Operating characteristics of queue
  - (j) Simulation

**Part – B (5x12=60 Marks)**  
**(Essay Answer Type)**

- 2 (a) Define Operations Research and discuss its managerial applications.

**OR**

- (b) Use graphical method to solve the following LPP

$$\begin{aligned} \text{Maximize } & Z = 4X_1 + 3X_2 \\ \text{Subject to : } & 2X_1 + X_2 \leq 1000 \\ & X_1 + X_2 \leq 800 \\ & X_1 \leq 400 \\ & X_2 \leq 700 \\ & X_1, X_2 \geq 0 \end{aligned}$$

- 3 (a) Solve the following LP Problem using Simplex method:

$$\begin{aligned} \text{Minimize } & Z = 3X_1 + 5X_2 + 4X_3 \\ \text{Subject to constraints: } & 2X_1 + 3X_2 \leq 8 \\ & 2X_1 + 5X_3 \leq 10 \\ & 3X_1 + 2X_2 + 4X_3 \leq 15 \\ & \text{Where } X_1, X_2, X_3 \geq 0 \end{aligned}$$

**OR**

- (b) Using duality, find the optimal solution of the following problems:

$$\begin{aligned} \text{Maximize } & Z = X_1 + X_2 + X_3 \\ \text{Subject to : } & X_1 - 3X_2 + 4X_3 = 5 \\ & X_1 - 2X_2 \leq 3 \\ & 2X_1 - X_3 \geq 4 \\ & X_1, X_2, X_3 \geq 0 \end{aligned}$$

..2..

- 4 (a) Solve the following transportation problem using Vogel's approximation method:

		To : D1	D2	D3	Supply
Jobs	A1	5	1	7	10
	A2	6	4	6	80
	A3	3	2	5	15
Demand		75	20	50	

**OR**

- (b) A company has four machines which are to be used for three jobs. Each job can be assigned to one and only one machine. The cost of each job on each machine is as follows:

		Machines			
		W	X	Y	Z
From	A	180	240	280	320
	B	080	130	170	180
	C	100	150	190	220

Find the job assignment pairs which shall minimize the cost?

- 5 (a) The following data pertains to a small project. Construct the network, find the expected duration and variance of each activity. Determine the critical path and the critical activities. Find a date such that it will have 95% chance of completing the project.

Activity	Immediate Predecessor	Duration (days)		
		a	m	b
A	NONE	4	5	8
B	A	5	7	10
C	NONE	8	11	12
D	NONE	2	3	7
E	B, C	4	7	10
F	D	6	9	15
G	D	8	12	16
H	E, F	5	6	9
I	E, F	3	5	7
J	G, I	5	8	11
K	H	6	9	13

**OR**

- (b) A small project consists of seven activities for which relevant data are given below:

Activity	A	B	C	D	E	F	G
Dependence	-	-	-	A, B	A, B	C, D, E	C, D, E
Duration (days)	4	7	6	5	7	6	5

1. Draw the network and find the project completion time.
2. Calculate total float for each of the activity.

..3

..3..

- 6 (a) In a bank, eight customers arrive on an average every 4 minutes, while the cashier can serve 9 customers in 4 minutes. Use Poisson distribution for arrival rate and exponential distribution for service rate. Determine:
- Average time a customer spends in the system
  - Average time a customer keeps waiting in line
  - Average number of customers in the system
  - Average queue length

**OR**

- (b) Solve the following 3 x 3 business game by assuming 'A' as maximizing player.

		Player - B		
		$B_1$	$B_2$	$B_3$
Player - A	$A_1$	1	2	-1
	$A_2$	-2	1	1
	$A_3$	2	0	1

\*\*\*\*\*