ACHARYA INSTITUTE OF TECHNOLOGY
Bangalore - 560090

USN | | | | | | | | | | |

10AU71

Seventh Semester B.E. Degree Examination, Dec.2016/Jan.2017
Operations Research

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Explain different phases of OR. **(10 Marks)**

b. The manager of an oil refinery must decide on the optimal mix of 2 possible blending processes of which the input and output for production are as follows:

Process	Input (Units)		Output (Units)	
	Crude A	Crude B	Crude A	Crude B
1	5	3	5	8
2	4	5	4	4

The maximum amount of crude available is 200 units of crude A and 150 units of crude B. The market requirement shows that at least 100 units of gasoline X and 80 units of gasoline Y must be produced. The profit for production run for process 1 and 2 are ₹300 and ₹400. Formulate a suitable mathematical model and solve by using graphical method. **(10 Marks)**

2 Solve the following LPP using simplex method,

Minimize $Z = 4x_1 + x_2$

Subject to $3x_1 + x_2 = 3$

$4x_1 + 3x_2 \geq 6$

$x_1 , 2x_2 \leq 4$

$x_1 , x_2 \geq 0$

(20 Marks)

3 a. Explain Degeneracy in transportation problem. **(05 Marks)**

b. A company has three plants at locations A, B, and C which supply to warehouses located at D, E, F, G and H. Monthly plant capacities are 800, 500 and 900 units respectively. Monthly warehouse requirements are 400, 500, 400 and 800 units respectively. Unit transportation costs are given below. Determine optimum distribution for the company in order to minimize the total transportation cost. **(15 Marks)**

		To				
		D	E	F	G	H
From	A	5	8	6	6	3
	B	4	7	7	6	5
	C	8	4	6	6	4

4 a. Distinguish between assignment problems and transportation problems. **(06 Marks)**

b. Products 1, 2, 3, 4 and 5 are to be processed on a machine. The set up costs in rupees per change depend upon the product presently on a machine and the set up to be made and are given by the following data:

$C_{12} = 16$, $C_{13} = 4$, $C_{14} = 12$, $C_{23} = 6$, $C_{24} = 5$, $C_{25} = 8$, $C_{35} = 6$, $C_{45} = 20$, $C_{iJ} = C_{Ji}$, $C_{Ji} = \infty$ for $i = J$ and for all values of i and J not given. Find the optimum sequence of products in order to minimize the total setup cost. **(14 Marks)**

PART – B

5 a. Mention the assumptions in sequencing problems. **(08 Marks)**

b. A shop floor is handling five jobs, each of which must go through machines A, B and C in the order ABC, processing time (in hrs) are given in the table. Determine the optimal sequence of jobs that minimizes the total elapsed time and the idle time for the machines A, B and C. **(12 Marks)**

Machines	Jobs				
	1	2	3	4	5
M/c A	8	10	6	7	11
M/c B	5	6	2	3	4
M/c C	4	9	8	6	5

6 a. Define :
(i) Queue length (ii) Waiting time (iii) Idle period (iv) Utilization **(05 Marks)**

b. In a Railway marshalling yard, goods train arrive at a rate of 30 trains per day. Assuming arrival and service as per Poisson and Exponential distributions and mean service time of 36 minutes, calculate
(i) The mean queue size (ii) The probability that the queue size exceeds 10. **(05 Marks)**

c. A box office ticket windows is being manned by a single server. Customers arrive to purchase tickets according to a Poisson input process with a mean rate of 30 per hour. The time required to serve a customer as an exponential distribution with a mean of 90 sec. Calculate (i) Mean queue length (ii) Mean line length (iii) Mean waiting time the system. (iv) Mean waiting time in the line. **(10 Marks)**

7 a. Define : (i) Strategy (ii) Pay-off matrix (iii) Two person zero sum game
(iv) Saddle point. **(10 Marks)**

b. Solve the following game: **(04 Marks)**

		Player B				
		I	II	III	IV	V
Player A	I	-2	0	0	5	3
	II	3	2	1	2	2
	III	-4	-3	0	-2	6
	IV	5	3	-4	2	6

c. Solve the following problem using Dominance principle **(06 Marks)**

		B			
		1	2	3	4
A	1	3	2	4	0
	2	2	4	3	4
	3	4	2	4	0
	4	0	4	0	8

8 a. Explain Fulkerson rule. **(08 Marks)**

b. A project consists of following activities with the duration in days:

Activity	Precedence	Duration in days
A	-	10
B	A	8
C	A	12
D	B	9
E	B	7
F	B, C	12
G	B, C	5
H	D, F	8

(i) Draw the Network of above project.
(ii) Identify the critical path and project duration.
(iii) Calculate the EST, EFT, LST, LFT, TF, FF and IF for each activity. **(12 Marks)**

* * * * *