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Reg. No. _____ Name: _____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD TRIMESTER MBA DEGREE EXAMINATION APRIL 2017**

MBA 36 OPERATIONS RESEARCH

Max. Marks: 60

Duration: 3 Hours

Any missing data shall be assumed. All assumptions must be clearly stated.

Use of statistical tables and graph sheets are permitted, if necessary.

Part A

(Answer all questions. Each question carries 2 marks)

1. Explain the role of Operations Research in Decision Making.
2. Outline about degeneracy in Transportation Problems
3. Prove that *the dual of the dual of a given primal is again a primal*, using an example.
4. List down the steps in Decision Tree Approach.
5. Discuss the various customer behaviours in a Queueing System.

(5x2 marks = 10 marks)

Part B

(Answer any 3 questions. Each question carries 10 marks)

6. Solve the given LPP using Simplex Algorithm:

$$\begin{aligned} &\text{Maximize, } Z = 30x_1 + 20x_2 \\ &\text{Subject to: } 3x_1 + x_2 \leq 1500 \\ &\quad \quad \quad x_1 + x_2 \leq 3000 \text{ and} \\ &\quad \quad \quad x_1, x_2 \geq 0 \end{aligned}$$

7. Find the Initial Basic Feasible Solution to the following Transportation Problem using VAM:

	D1	D2	D3	D4	Supply
S1	20	25	28	31	200
S2	32	28	32	41	180
S3	18	35	24	32	110
Demand	150	40	180	170	

8. a) Discuss Hungarian Method, in detail. (4 marks)
- b) A book binder has one printing press, one binding machine and the manuscripts of number of different books. The time required to perform the printing and binding operations for each book is shown below.

Books	B1	B2	B3	B4	B5	B6
Printing Time (hrs.)	30	120	50	20	90	100
Binding Time (hrs.)	80	100	90	60	30	10

Determine the sequence in which books should be processed, in order to minimize the

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total time required to turn out all the books. Also calculate the minimum elapsed time and the idle times available with printing press and binding machine. (6 marks)

9. A manufacturer of utensils has estimated the following distribution of demand for a particular kind of kitchen utensil.

No. of utensils demanded	0	1	2	3	4	5	6
Probability	0.14	0.27	0.27	0.18	0.09	0.04	0.01

Each utensil costs him Rs.7,000 and he sells them for Rs.10,000 each. Any utensils that are left unsold at the end of the season must be disposed of for Rs. 6,000 each. How many utensils should be in stock so as to maximize his expected profit?

10. Customers arrive at one mobile phone service center (with only one technician) according to a Poisson process with a mean inter-arrival time of 20 minutes. Customers spend on an average of 15 minutes in the service area.
- What s the probability that a new arrival need not wait for the technician to be free?
 - What is the expected no. of customers in the service center?
 - How much time can a customer expect to wait for his turn?
 - How much time can a customer expect to spend in the shop?

(3x10 marks = 30 marks)

Part C

Compulsory question, the question carries 20 marks

11. a) What are the different decision making environments? Explain. (4 marks)
 b) An engineering project consists of 9 activities, which are shown as below with their time estimates (*in days*).

Activity	1-2	1-6	2-3	2-4	3-5	4-5	6-7	5-8	7-8
<i>Optimistic time</i>	1	2	2	2	7	5	5	3	8
<i>Most likely time</i>	7	5	14	5	10	5	8	3	17
<i>Pessimistic time</i>	3	14	26	8	19	17	29	9	32

- Draw the project network diagram
 - Find the project duration
 - Calculate the probability of the project completing in 40 days. (8marks)
- c) Solve the game whose pay-off matrix is :

	<i>Player Y</i>	
<i>Player X</i>	2	8
	10	6

(8marks)