Reg No.:_____ Name:_____

# APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

THIRD TRIMESTER MBA DEGREE EXAMINATION(R&S), MAY 2019

**Course Code: 36**

**Course Name: OPERATIONS RESEARCH**

Max. Marks: 60 Duration: 3Hours

***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.*** Marks

1 OR is the art of finding bad answers where worse exists. Comment (2)

2 What conditions must exist in a simplex table to establish the existence of an infeasible solution? (2)

3 List down the different Customer's Behaviour in a queue (2)

4 What do you mean by State of Nature in Decision theory? (2)

5 When does crashing become relevant in network analysis? (2)

## PART B

***Answer any 3 questions. Each question carries 10 marks.***

6 a) A furniture company can produce 4 types of chairs. Each chair is first made in a carpentry shop and then furnished, waxed, and polished in the finishing shop. The man hour required in each are: (10)

| | chair type | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Carpentry Shop | 14 | 9 | 8 | 10 |
| Finishing Shop | 2 | 1 | 3 | 40 |
| (Contribution per chair) | 20 | 12 | 8 | 20 |

The total no of man hours available per month in carpentry and finishing shops are 6000 and 4000 respectively. Assuming an abundant supply of raw material and abundant demand for finished products, construct LPP

b) Give short notes about

i) Slack variables

ii) Surplus variables

iii) Artificial variables

7 Solve the following L.P.P. using simplex method (10)

Minimize $Z = 5X_1 + 3X_2$

Subject to $2X_1 + 4X_2 \leq 12$

$2X_1 + 2X_2 = 10$

$5X_1 + 2X_2 \geq 10$,

And $X_1, X_2 \geq 0$

8 A book stall at a certain bus station sells for Rs. 5.00, a copy of daily newspapers for which it pays Rs.4.00. Unsold papers are return for a refund of Rs. 3.50.Daily sales and corresponding probabilities are as follows: (10)

Daily Sales .... 500 600 700

Probability... 0.50 0.30 0.20

How many copies should it order each day to get maximum expected profit?

9 A machine owner finds from his past records that the average cost per year of maintaining a machine purchase price is Rs.6000 are as given below: (10)

| **Year** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Maintenance Cost(Rs.)** | 1000 | 1200 | 1400 | 1800 | 2300 | 2800 | 3400 | 4000 |
| **Resale Price(Rs.)** | 3000 | 1500 | 750 | 375 | 200 | 200 | 200 | 200 |

Determine at what age is a replacement due?

10 In a railway marshalling yard, goods trains arrive a rate of 30 trains per day. Assuming that the inter- arrival time follows an exponential distribution and the service time distribution is also exponential with an average 36 minutes. Calculate the following (10)

a. Average Length of Non- empty Queue

b. The probability that the queue size exceeds 10.

## PART C

***Compulsory Question, the question carries 20 marks.***

11 Consider the schedule of activities and related information for the construction of a new plant as shown. (20)

| Activity | Expected Time (months) | Variance | Expected Cost ('000 Rs.) |
|---|---|---|---|
| **1-2** | **4** | **1** | **5** |
| **2-3** | **2** | **1** | **3** |
| **3-6** | **3** | **1** | **4** |
| **2-4** | **6** | **2** | **9** |
| **1-5** | **2** | **1** | **2** |
| **5-6** | **5** | **1** | **12** |
| **4-6** | **9** | **5** | **20** |
| **5-7** | **7** | **8** | **7** |
| **7-8** | **10** | **16** | **14** |
| **6-8** | **1** | **1** | **4** |

i) Construct the network diagram and find the critical path

Calculate the :

ii) Expected cost of construction of the plant

iii) Expected time required to build the plant

iv) Standard deviation of the expected time to build the plant

v) Probability that the project will be completed within 25 months

vi) Probability that the project will not be completed within 25 months

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