**Code: AE62/AC62/AT62   Sub.: OPERATIONS RESEARCH & ENGG. MANAGEMENT**

## AMIETE – ET/CS/IT (NEW SCHEME)

Time: 3 Hours          **DECEMBER 2011**          Max. Marks: 100

**NOTE: There are 9 Questions in all.**
- **Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.**
- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions, answer any FIVE Questions. Selecting THREE questions from part A and TWO questions from part B.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

**Q.1**   **Choose the correct or the best alternative in the following:**          (2×10)

a. The values of the decision variable that satisfy the constant and non-negative restricted constitute a

   **(A)** Basic solution          **(B)** Basic feasible solution
   **(C)** Infeasible solution          **(D)** Optimal solution

b. The number of basic solution of linear programming problem in which there are m constant and n decision variable is given by

   **(A)** $^{n}C_{m}$          **(B)** $^{n}P_{m}$

   **(C)** $^{m+n}C_{m}$          **(D)** $^{m+n}P_{m}$

c. In graphical method the extreme point of a feasible region of a Linear programming problem corresponds to

   **(A)** Basic solution          **(B)** Basic feasible solution
   **(C)** Either **(A)** or **(B)**          **(D)**  None of the above

d. If an activity has zero slack, it implies that

   **(A)**  it is a dummy activity
   **(B)**  it lies on the critical path
   **(C)** There are more than one critical path
   **(D)**  The project is progressing well

e. In which of the following distribution, it has forgetfulness or lack of memory property

   **(A)** Uniform Distribution          **(B)** Exponential Distribution
   **(C)** Normal distribution          **(D)** None of the above

f. When maximin and minimax 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 the above

g. Which management task occupies the longest time

   **(A)** Planning               **(B)** Organizing
   **(C)** Integrating            **(D)** Measuring

h. High accuracy, short term forecasts are suited to _____ techniques

   **(A)** Delphi                **(B)** Time series
   **(C)** Normative relevance     **(D)** moving average

i. _____ says that the average person dislikes work and will do everything possible to avoid it

   **(A)** Theory X           **(B)** Theory Y
   **(C)** Maslow's           **(D)** Herzberg

j. _____ is a form of meeting in which participants are encouraged to put forward new ideas

   **(A)** Filter meetings       **(B)** Amplifier meetings
   **(C)** Brainstorming        **(D)** None of the above

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## PART A
### Answer any THREE Questions. Each question carries 16 marks.

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**Q.2** a. "OR is more than just mathematics" Prove the statement with the help of two examples. **(6)**

    b. Ozark Farms uses at least 800 lb of special feed daily. The special feed is a mixture of corn and soybean meal with the following compositions:

| Feedstuff | lb per lb of feedstuff | | |
| --- | --- | --- | --- |
| | Protein | Fiber | Cost ($/lb) |
| Corn | .09 | .02 | .30 |
| Soybean meal | .60 | .06 | .90 |

    The dietary requirements of the special feed are at least 30% protein and at most 5% fiber. Ozark Farms wishes to determine the daily minimum-cost feed mix. Formulate the above as a linear problem. **(10)**

**Q.3** a. Use Big-M method to solve
maximize $z = 3x_1 - x_2$
Subject to the constraints
$2x_1 + x_2 \geq 2$
$x_1 + 3x_2 \leq 3$
$x_2 \leq 4$
$x_1, x_2 \geq 0$ **(12)**

b.  Obtain dual of the following LPP **(4)**
maximize   $z = 5x_1 - 2x_2 + 3x_3$
Subject to constraints:
$2x_1 + 2x_2 - x_3 \geq 2$
$3x_1 - 4x_2 \leq 3$
$x_2 + 3x_3 \leq 5$
$x_1, x_2, x_3 \geq 0$

**Q.4**   a.  Use Vogel's Approximation method to obtain an initial feasible solution of the transportation cost (T.C) problem **(8)**

|   | D | E | F | G | Availability |
|---|---|---|---|---|---|
| A | 11 | 13 | 17 | 14 | 250 |
| B | 16 | 18 | 14 | 10 | 300 |
| C | 21 | 24 | 13 | 10 | 400 |
| Requirement | 200 | 225 | 275 | 250 | |

b.  Four different jobs can be done on four different machines. The set up and take down time costs are assumed to be prohibitively high for changeovers. The matrix below gives the cost in rupees of producing job i on machine j. **(8)**

|    | $m_1$ | $m_2$ | $m_3$ | $m_4$ |
|----|----|----|----|----|
| j1 | 5 | 7 | 11 | 6 |
| j2 | 8 | 5 | 9 | 6 |
| j3 | 4 | 7 | 10 | 7 |
| j4 | 10 | 4 | 8 | 3 |

How should the jobs be assigned to the various machines so that total cost is minimized?

**Q.5**   a.  Define the following terms--------- **(4)**
(i)   Critical Activity          (ii)  Non Critical Activity
(iii)  Total float               (iv)  Free Float

b.  From the following data given, construct the project network and identify the critical path, its duration and total slack of each activity. **(12)**

| Activity :- | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| Immediate Predecessor:- | - | A | A | B | (C,D) | D | F | (E,G) |
| Time(Weeks):- | 1 | 4 | 3 | 2 | 5 | 2 | 2 | 3 |

**Q.6**  a.  Solve the game given below by graphical method  **(10)**

$$\begin{array}{c c c c c}
 & B_1 & B_2 & B_3 & B_4 \\
A_1 & 4 & -2 & 3 & -1 \\
A_2 & -1 & 2 & 0 & 1 \\
A_3 & -2 & 1 & -2 & 0
\end{array}$$

b.  In a railway marshalling yard, goods trains arrive at 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;  **(6)**
(i)  the mean queue size(line length) and
(ii)  the probability that the queue size exceeds 10.
If the input of trains increases to an average 33 per day, what will be the change in (i) and (ii) ?

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**PART B**
**Answer any TWO questions. Each question carries 16 marks.**

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**Q.7**  a.  What are the different management tasks a manager has to perform?  **(8)**

b.  Define "Organization". Explain the different types of organization structure.**(8)**

**Q.8**  a.  Explain the decision making process in brief.  **(8)**

b.  Explain the causal model for forecasting.  **(8)**

**Q.9**  a.  What is market segmentation & what are the different methods used in market segmentation.  **(8)**

b.  Explain the different motivational theories.  **(8)**