

**B.TECH SEM – VII (2007 COURSE) (PRODUCTION ENGG.) :**

**WINTER - 2017**

**SUBJECT: OPERATION RESEARCH**

Day : **Wednesday**

Date : **17/01/2018**

**W-2017-2616**

Time : **02.30 PM TO 05.30 PM**

Max Marks : **80**

**N.B.**

- 1) **Q. No. 1 and Q. No. 5 are COMPULSORY.** Out of the remaining attempt any **TWO** questions from each Section.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answer to the both the section should be written in **SEPARATE** answer book.
- 4) Use non-programmable electronic calculator is **ALLOWED**.

**SECTION-I**

- Q.1**
- a) State the characteristics of operation Research. **(04)**
  - b) Explain the degeneracy in simplex method. **(05)**
  - c) Explain Hungarian method to solve assignment problem. **(05)**
- Q.2**
- a) Discuss the various phases in solving an operation research problem. **(07)**
  - b) Describe significant features of operation research and explain various operation research models. **(06)**
- Q.3**
- a) A firm makes two products X and Y, and has a total production capacity of 9 tonnes per day, X and Y requiring the same production capacity. The firm has a permanent contract to supply at least 2 tonnes of X and at least 3 tonnes of Y per day to another company. Each tonne of X requires 20 machine hours of production time and each tonne of Y requires 50 machine hours of production time. The daily possible number of machine hours is 360. All the firms output can be sold, and the profit made is Rs. 80 per tonne of X and Rs. 120 per tonne of Y. It is required to determine the production schedule for maximum profit and calculate this profit. **(Use graphical method)** **(07)**
  - b)  $Max. Z = 30x_1 + 20x_2$  **(06)**  
 $Subject\ to\ 3x_1 + x_2 \leq 1500$   
 $x_1 + x_2 \leq 3000$   
 $x_1, x_2 \geq 0$   
Solve the above problem by simplex method.
- Q.4**
- a) What is degeneracy in Transportation problem? **(04)**
  - b) **(09)**

Absentees Vs Lectures

| Day   | Lecture | 1  | 2  | 3  | 4 | 5  |
|-------|---------|----|----|----|---|----|
|       | Mon.    | 3  | 2  | 3  | 9 | 10 |
| Tues. | 11      | 5  | 9  | 10 | 2 |    |
| Wed.  | 1       | 3  | 8  | 2  | 4 |    |
| Thur. | 8       | 11 | 10 | 5  | 2 |    |
| Fri.  | 8       | 6  | 5  | 6  | 9 |    |

Schedule these lectures in such a way as to minimize the total number of students forced to remain absent.

**P.T.O.**

**SECTION - II**

- Q.5** a) Explain the general structure of queuing system. (04)  
 b) List the advantages and disadvantages of simulation techniques. (05)  
 c) Explain the three time estimates in PERT. (05)

- Q.6** a) Give the application of queuing modes. (04)  
 b) Customers arrive at one person barber shop according to a Poisson process with a mean inter-arrival time of 20 minutes. Customers spend on an average of 15 minutes in the barber's chair. (09)  
 i) What is the probability that a new arrival need not wait for the barber to be free?  
 ii) What is the expected number of customers in the barber shop?  
 iii) How much time can a customer expect to wait for his turn?  
 iv) How much time can a customer expect to spend in the shop?

- Q.7** a) We have five jobs, each of which must go through machines A, B and C in the order ABC Processing time (in hours) are given in the following table: (06)

| Machine | 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  |

Determine the optimal sequence of jobs that minimizes the total elapsed time.

- b) A manufacturer, finds from his past records that the costs per year associated with a machine with a purchase price of Rs. 50000 are as given below: (07)

| Year               | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     |
|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Running Cost (Rs.) | 15000 | 16000 | 18000 | 21000 | 25000 | 29000 | 34000 | 40000 |
| Scrap Value (Rs.)  | 35000 | 25000 | 17000 | 12000 | 10000 | 5000  | 4000  | 4000  |

Determine the optimum policy.

- Q.8** a) What is the significance of "saddle point" in the payoff matrix in the game theory? (04)  
 b) The following table gives the activities in a construction project and other related information is given below, (09)

| Activity | $t_o$ | $t_m$ | $t_p$ |
|----------|-------|-------|-------|
| 1-2      | 20    | 30    | 46    |
| 1-3      | 9     | 12    | 21    |
| 2-3      | 3     | 5     | 7     |
| 2-4      | 2     | 3     | 4     |
| 3-4      | 1     | 2     | 3     |
| 4-5      | 12    | 18    | 24    |

Determine

- i) Draw a PERT diagram.  
 ii) Calculate total project duration.  
 iii) Mark critical path.  
 iv) Find the probability that the project will be completed in 50 days.