**AKGEC/IAP/FM/02**

**Ajay Kumar Garg Engineering College, Ghaziabad**

**Department of Mechanical Engineering**

**Sessional Test-2**

Course: B. Tech Semester: VII

Session: 2017-18 Section: CE-1, 2 ECE-1, 2,

3 EI-1 EN-1, 2

Subject: Operations Research Sub. Code: NOE-073

Max Marks: 50 Time: 2 hour

Note: Answer **all** the sections.

**Section-A**

1. Attempt **all** the parts: (5x2=10)
2. What do you mean by critical path?
3. Explain various types of time used in PERT.
4. What do you mean by unbalanced and balanced transportation problem? How the unbalanced transportation problem is converted into balanced transportation problem?
5. What are the direct and indirect cost?
6. Excluding CPM and PERT what are the other network techniques you know? Explain any one.

**Section-B**

1. Attempt **all** the parts: (5x5=25)
2. There are 5 technicians who can work on 5 different machines having the same configuration. The average time taken by each technician to make a job on each machine is given in the following table. Find the optimal assignment so that the total working time to make five jobs (one by each) is minimum.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Technicians\Machines | M1 | M2 | M3 | M4 | M5 |
| T1 | 7 | 8 | 9 | 9 | 8 |
| T2 | 8 | 9 | 11 | 10 | 9 |
| T3 | 7 | 8 | 10 | 8 | 9 |
| T4 | 10 | 9 | 8 | 9 | 10 |
| T5 | 10 | 8 | 9 | 11 | 9 |

1. The cost matrix between different warehouses and facilities are given in the following table. Solve the transportation problem by VAM method.

**P.T.O.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| From\To | W1 | W2 | W3 | W4 | Supply |
| F1 | 3 | 5 | 2 | 2 | 90 |
| F2 | 8 | 9 | 2 | 5 | 80 |
| F3 | 2 | 8 | 9 | 8 | 90 |
| Demand | 50 | 65 | 65 | 70 |  |

1. (i) Write down the complete mathematical model of the following transportation problem.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| From\To | M1 | M2 | M3 | M4 | Supply |
| V1 | 10 | 2 | 20 | 11 | 15 |
| V2 | 12 | 7 | 9 | 20 | 25 |
| V3 | 4 | 14 | 16 | 18 | 10 |
| Demand | 5 | 15 | 15 | 15 |  |

(ii) Explain the different features of activities while making a network diagram.

1. Write down the differences between CPM and PERT.
2. A project consists of a series of tasks labelled A, B, ……….. , H, I and corresponding time are 23, 8, 20, 16, 24, 18, 19, 4 and 10 days respectively. Construct the network diagram having the following constraints:

A< D, E; B, D<F; C<G; B, G<H; F, G<I

**Section-C**

C. Attempt **all** the parts: (2x7.5=15)

1. From the following activity table, draw a network diagram and find the critical path. Also calculate the start timings, finishing timings and total float of each activity.

|  |  |  |  |
| --- | --- | --- | --- |
| Activity | Duration | Activity | Duration |
| 1-2 | 6 | 3-5 | 6 |
| 1-3 | 8 | 4-5 | 0 |
| 1-4 | 10 | 4-7 | 6 |
| 2-3 | 7 | 5-6 | 4 |
| 2-5 | 7 | 6-8 | 7 |
| 3-4 | 10 | 7-8 | 2 |

1. The different data is given in the following table. Using these values find the optimal cost and time of the project completion.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Activity | Natural Time | Crash Time | Natural Cost | Crash Cost |
| 1-2 | 8 | 5 | 1000 | 2800 |
| 1-3 | 5 | 3 | 1200 | 1800 |
| 2-3 | 6 | 4 | 1800 | 2200 |
| 2-4 | 7 | 7 | 1000 | 1000 |
| 3-4 | 4 | 2 | 1200 | 3600 |
| 4-5 | 3 | 1 | 500 | 2700 |

The indirect cost is Rs500/day.