7. The time estimates (in weeks) for the activities of a PERT network are as follows: 20

Activity	Least time	Most likely time	Greatest time
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

(a) Draw the project network and identify all the paths through it.

(b) Determine the expected project length.

(c) Calculate the standard deviation and variance of the project length.

Section-D

8. (a) What is simulation ? Describe its advantages in solving the problems. Give its main limitations with suitable examples.   10

(b) Using mixed congruential method, generate a sequence of five three digit random numbers such that :   10

$x_{n+1} = (301x_n + 503)$ (modulo 1000) and $x_0 = 500$

9. Write notes on :   20

(a) SIMON model

(b) Decision making under uncertainty

(c) Decision making under risk

B.Tech. 7th Semester (F) Scheme (ME) Examination, December-2018

OPERATION RESEARCH

Paper-ME-405-F

Time allowed : 3 hours]   *[Maximum marks : 100*

Note : *Attempt* **five** *questions in all, selecting* **one** *question from each section.* **Question no. 1 is compulsory.**

1. (a) What do you mean by infeasibility and unboundedness in linear programming.

(b) Write short note on assignment problem and its applications.

(c) Explain the terms balking and queue discipline.

(d) Define float. Explain its different types.

$5 \times 4 = 20$

Section-A

2. (a) What is operation research ? Discuss its applications in industry.   10

(b) Explain the different types of models used in operation research. Explain briefly the general methods for solving these models.   10

3. Maximize $z = x_1 + 3x_2 - 2x_3$, subject to constraints : 20

$$x_1 + 2x_2 + 2x_3 = 6 ;$$

$$-x_1 - x_2 + x_3 \leq -2 ;$$

$$x_1 , x_2 , x_3 \geq 0$$

Section-B

4. Solve the following transportation problem where cell entries are unit costs. 20

	W_1	W_2	W_3	W_4	W_5	Available
F_1	68	35	4	74	15	18
F_2	57	88	91	3	8	17
F_3	91	60	75	45	60	19
F_4	52	53	24	7	82	13
F_5	51	18	82	13	7	15
Required	16	18	20	14	14	82

5. (a) Explain the primal dual relationships in LPP. Give the economic interpretation of dual variables. 10

   (b) Discuss the use of sensitivity analysis for post optimal problems. 10

Section-C

6. Arrival rate of telephone calls at a telephone booth are according to Poisson distribution, with an average time of 9 minutes between two consecutive arrivals. The length of telephone call is assumed to be exponentially distributed, with mean 3 minutes. 20

   (a) Determine the probability that a person arriving at the booth will have to wait.

   (b) Find the average queue length that is formed from time to time.

   (c) The telephone company will install a second booth when convinced that an arrival would expect to have to wait at least four minutes for the phone. Find the increase in flow rate of arrivals which will justify a second booth.

   (d) What is the probability that an arrival will have to wait for more than 10 minutes before the phone is free ?

   (e) What is the probability that he will have to wait for more than 10 minutes before the phone is available and the call is also complete ?

   (f) Find the fraction of a day that the phone will be in use.