PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION MAY 2019
(Sixth Semester)

Branch – **MATHEMATICS WITH COMPUTER APPLICATIONS**

OPERATIONS RESEARCH

Time : Three Hours   Maximum : 75 Marks

SECTION-A (20 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks   (10 x 2 = 20)

1   Define optimum solution.
2   Define slack variable.
3   Define triangular basis.
4   What is unbalanced transportation problem?
5   Define equilibrium or saddle point.
6   Define value of the game.
7   Define network.
8   Define independent float.
9   Explain M/M/1 queueing system.
10   What is Little's formula?

SECTION - B (25 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 5 = 25)

11 . a   Solve the following LPP by graphical method
       Minimize $z = 4x_1 + 2x_2$
       Subject to constraints
$$x_1 + 2x_2 \geq 2$$
$$3x_1 + x_2 \geq 3$$
$$4x_1 + 3x_2 \geq 6$$
$$x_1, x_2 \geq 0.$$
       OR

  b   State and prove fundamental theorem of Duality.

12 a   Obtain initial basic feasible solution to the following T.P using NWC rule.

	D_1	D_2	D_3	Supply
O_1	2	7	4	5
O_2	3	3	1	8
O_3	5	4	7	7
O_4	1	6	2	14
Demand	7	9	18	34

       OR

  b   Solve the following assignment problem: $\begin{bmatrix} 1 & 4 & 6 & 3 \\ 9 & 7 & 10 & 9 \\ 4 & 5 & 11 & 7 \\ 8 & 7 & 8 & 5 \end{bmatrix}$.

13 a   For the game with the following pay-off matrix, determine the optimum strategies and the value of the game $P_1 \begin{matrix} & P_2 \\ & \begin{bmatrix} 5 & 1 \\ 3 & 4 \end{bmatrix} \end{matrix}$.

       OR

14 a Construct the network diagram comprising acitivies B, C,… Q and N such that following constraints are satisfied : B < E, F; C < G , L; E, G < H; L, H < I; L < M ; H < N; H < J; I, J < P; P < Q. The notation X < Y means that the activity X must be finished before Y can begin.

OR

b Explain rules of Network construction.

15 a Explain distribution of inter-arrival times (Exponential process).

OR

b A T.V repairman find that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs set in the order in which they came in and if the arrival set is approximately Poisson with an average rate of 10 per 8 hours day. What is repairman's expected idle time each day. How many jobs are head of the average.

SECTION - C (30 Marks)
Answer any **THREE** Questions
ALL Questions Carry **EQUAL** Marks   (3 x 10 = 30)

16 Use Simplex method to solve the following L.P.P
Maximize $z = x_1 + 2x_2$ subject to
$$-x_1 + 2x_2 < 8$$
$$x_1 + 2x_2 < 12$$
$$x_1 - 2x_2 < 3$$
$$x_1 > 0 \text{ and } x_2 > 0.$$

17 Solve the following assignment problem

	I	II	III	IV
A	42	35	28	21
B	30	25	20	15
C	30	25	20	15
D	24	20	16	12

18 Solve the following 2 x 3 game graphically

Player B

Player A $\begin{bmatrix} 1 & 3 & 11 \\ 8 & 5 & 2 \end{bmatrix}$.

19 A small project is composed of seven activities whose time estimates are listed in the table.

Activity i	j	Optimistic	Most likely	Pessimistic
1	2	1	1	7
1	3	3	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 work
(b) Find the expected duration and variance of each activity
(c) Calculate the variance and SD of project length.

20 At a railway station only one train is handled at a time. The railway word is sufficient by only for two trains to wait while other is given signal to leave the station. Trains arrive at the station at an average rate of 6 per hour and the railway station can handle them on an average of 12 per hour. Assuming poisson arrivaly and exponential service distribution. Find the steady state