\ **14MAU15**

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2018
(Fifth Semester)

Branch- MATHEMATICS

OPERATIONS RESEARCH

Time : Three Hours Maximum : 75 Marks

SECTION-A (20 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10x2 = 20)

1 Define optimum basic feasible solution of a linear programming problem.

2 Write the dual of the primal problem.
Maximize $z = c^i + c_2x_2 + ... + c_nx_n$
Subject to the constraints
$ajixi + a_{i2}x_2 + ... + a_{in}x_n = bi$, I = 1, 2, ... m
$xj > 0$, j = 1, 2, ...n.

3 What are the common methods to obtain an initial basic feasible solution for a transportation problem.

4 What is an assignment problem?

5 Define pure strategy.

6 Find the value of the game whose payoff matrix is

	B_1	B_2
A_1	9	2
A_2	8	6
A_3	6	4

7 Define a network.

8 Define total float and free float.

9 Define transient state and steady state queueing system.

10 What do you mean by the server utilization factor?

SECTION - B (25 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks **(5x5 = 25)**

11 a Find all the basic solutions to the following system of linear equations:
$X_1 + 2x_2 + x_3 = 4$
$2x_1 + x_2 + 5x_3 = 5$
Hence find how many of them are non-degenerate?

OR

b Formulate the dual of the following linear programming problem:
Maximize $z = 3x_1 + x_2 + x_3 + 4x_4$
Subject to $x_1 + x_2 - 2x_3 + x_4 = 5$
$X_1 - 2x_2 + 4x_3 + 2x_4 = 10$
$X_1, X_2, X_3, X_4 > 0$.

Cont

For the following transportation problem, find a basic feasible solution by north west corner rule:

	D_1	D_2	D_3	D_4	D_5	D_6	Supply
0!	6	4	8	4	9	6	4
0_2	6	7	13	6	8	12	5
0_3	3	9	4	5	9	13	3
0_4	10	7	11	6	11	10	9
Demand	4	4	5	3	2	3	

OR

Solve the following assignment problem

	I	II	III	IV
A	2	10	9	7
B	15	4	14	8
C	13	14	16	11
D	4	15	13	9

Solve the following game and find the value of the game:

	B	
A	6	-3
	-3	0

OR

Solve the following game and find the value of the game.

	Bi	B_2	B_3
A,	10	5	-2
A_2	13	12	15
A_3	16	14	10

Construct the arrow diagram comprising activities A, B,.... And L such that the following relationships are satisfied:

i) A, B and C the first activities of the project, can start simultaneously
ii) A and B precede D,
iii) B precedes E, F and H,
iv) F and C precede G,
v) E and H precede I and J,
vi) C, D, F and J precede K,
vii) K precedes L,
viii) I, G and L are the terminal activities of the project

OR

Write the differences between PERT and CPM.

A transport company has one reservation clerk on duty at a time and he handles bus schedules and makes reservations, customers arrive at a rate of 8 per hour and the clerk can service 12 customers on an average per hour find

i) The average number of customers in the system
ii) The average number of customers in queue
iii) The average time a customer has to wait in system
iv) The average waiting time of a customer in queue.

OR

If for a period of 2 hours (8 to 10 am) trains arrive at the yard every 20 minutes but the service time continues to remain 36 minutes, then

' J /:\ «T-rvV.ahUitv that the yard is empty (ii)

SECTION - C (30 Marks)

Answer any **THREE** Questions
ALL Questions Carry **EQUAL** Marks (3 x 1 0 ^ 30)

16 Use Simplex method to solve the following LPP:
Maximize z = 3xi + x_2
Subject to X] - x_2 < 1, 3xi - 2x_2 < 6, xj, x_2 > 0.

17 Find the initial basic feasible solution by Vogel's approximation method and the optimum solution to the following transportation problem:

	D_1	D_2	D_3	D_4	Supply
S_1	3	7	6	4	5
S_2	2	■ 4	3	2	2
S_3	4	3	8	5	3
Demand	3	3	2	2	

18 Solve the following game graphically:

	Player B			
Player A	1	3	-3	7
	2	5	4	-6

19 A small project consists of seven activities for which the relevant data are given below:

Activity	Preceding activities	Activity duration (Days)
A	-	4
B	-	7
C	-	6
D	A, B	5
E	A, B	7
F	C, D, E	6
G	C, D, E	5

Draw the network, find the critical path and project completion time.

20 Patients arrive at a clinic according to a Poisson distribution at a rate of 30 patients per hour. The waiting room does not accommodate more than 14 patients. Examination time per patient is exponential with mean rate 20 per hour.

i) Find the effective arrival rate at the clinic
ii) What is the probability that an arriving patient will not wait?
iii) What is the expected waiting time until a patient is discharged from the clinic?

Z-Z-Z END