B.Com.(A&F) DEGREE EXAMINATION,NOVEMBER 2018
I Year II Semester
Allied Paper II
OPERATIONS RESEARCH

Time : 3 Hours **Max.marks :75**

Section A $(10 \times 2 = 20)$ Marks

Answer any **TEN** questions

1. Operation research
2. What is LPP?
3. Define artificial variable
4. What is unbalanced assignment problem?
5. What is degeneracy in TP?
6. Define queueing theory
7. Explain Big M-model?
8. Find the optimal solution for the assignment problem with following cost matrix.

		Area			
		W	X	Y	Z
SALESMAN	A	11	17	18	16
	B	9	7	12	6
	C	13	16	15	12
	D	14	10	12	11

9. Determine an initial basic feasible solution to the following transportation problem using the north-west corner rule

	D_1	D_2	D_3	D_4	Availability
O_1	6	4	1	5	14
O_2	8	9	2	7	16
O_3	4	3	6	2	5
Requirements	6	10	15	4	35

10. The following table gives the pays for different strategies under different state of nature

	state of nature		
Strategies	S1	S2	S3
A	10000	3000	2000
B	20000	25000	-15000
C	30000	18000	-50000

Find the decision rule under
(i) Maximax ; (ii) Maximin; (III) Minimax; (iv) Laplace criterion

11. A TV repairman finds that the time spent on his job has an exponential distribution with mean 30 minutes. if he repairs sets in the order in which they come in and if the arrival of sets in approximately Poisson with an average rate of 10 per 8-hour day (I) how many jobs are ahead of the set just brought in? (ii) what is the repairmen's expected idle time each day?
The following data are the characteristics of a project.

Activity	Immediate Predecessors	Duration in days
A	-	2
B	A	3
C	A	4
D	B, C	6
E	-	2
F	E	8

(i) Draw the network diagram for the above project
(ii) Find the minimum project completion time and the critical path

12. What is decision Tree?

Section B $(5 \times 5 = 25)$ Marks

Answer any **FIVE** questions

13. The ABC manufacturing company can make two products P1 and P2. Each of the products requires time on a cutting machine and a finishing machine. Relevant data are

	Product	
	P1	P2
Cutting hours(per unit)	2	1
Finishing hours (per unit)	3	3
Profit(per unit)	Rs. 6	Rs.4
Maximum sales(unite per week)	-	200

The number of cutting hour available per week is 390 and number of finishing hours available per week is 810. How much should be produced of each product in order to achieve maximum profit for the company?

14. What are the criteria for decision making under uncertainty?

15. Solve the following LPP by simplex method

Maximise $Z = x_1 + 2x_2$

Subject to $X_1 - X_2 \geq 3$

$2X_1 + X_2 \leq 10$

$X_1 - X_2 \geq 0$

16. Find the minimum cost solution for the following transportation problem which has cost structure as

	To			Availability
From	16	19	12	14
	22	13	19	16
	14	28	8	12
Requirement	10	15	17	

17. The secretary of a school is taking bids on the city's four schools bus routes. Four companies have made the bids as detailed in the following table:

Bids

	Route 1	Route 2	Route 3	Route 4
Company 1	Rs. 4000	Rs. 5000	____	____
Company 2	____	Rs. 4000	____	Rs. 4000
Company 3	Rs. 3000	____	Rs. 2000	____
Company 4	____	____	Rs. 4000	Rs. 5000

Suppose each bidder can be assigned only one route. Use the assignment model to minimize the school's cost of running the four bus routes.

18. Western National Bank is considering opening a drive-in window for customer service. Management estimates that the customers will arrive for service at the rate of 15 per hour. The teller who it is considering staffing the window can services customers at the rate of one every three minutes. Assuming poison arrivals and exponential service time find (i) utilization of the teller (II)average number in the waiting line (III) average number in the system (iv)average waiting time in the line (v) average waiting time in the system.

19. The following table gives the activities in a construction project and other relevant information.

Activity	1-2	1-3	2-3	2-4	3-4	4-5
Duration(days)	20	25	10	12	6	10

(i) Draw the net work for the project
(ii) Find the critical path and the project duration
(iii) Find the total float for each activity

Section C $(2 \times 15 = 30)$ Marks

Answer any **TWO** questions

20. A distributor of a certain product incurs holding cost of Rs.100 per unit per week and shortage cost of Rs. 300 per unit. The data on the sales of the product are given bellow.

Weekly sales (units) No. of weeks	0	1	2	3	4	5	6	7	8
frequency:	0	0	5	10	15	15	5	0	0

How many units should the distributor buy every week? Also find E.V.P.I.

21. An Organizing producing four different products viz. A,B, C and D having four operations viz. P,Q ,R and S who are capable of producing any of the four products, works effectively 7 hours a day. The time (in minutes) required for each operator for producing each of the products are given bellow in the cells of the following matrix along with profits (Rupees per unit).

Operator / Product

	A	B	C	D
P	6	10	14	12
Q	7	5	3	4
R	6	7	10	10
S	20	10	15	15
Profit(Rupees.units)	3	2	4	1

Find out the assignment operator which will maximize the profit

22. The project has the following characteristics.

Activity	Duration (weeks)	Predecessors
A	6	None
B	8	A
C	4	A
D	9	B
E	2	C
F	7	D

Construct the network and compute T_E, T_L for each and the critical path and project duration

23. Kumar enterprise has three factories at locations *A, B, C* which supplies to three warehouses located at *D, E, F.* Monthly factory capacities are 10, 80 and 15 units respectively. Monthly warehouse requirements are 75, 20, and 50 units respectively. Unite shipping cost (in rupees) are given bellow.

Factory / Warehouse

	D	E	F
A	5	1	7
B	6	4	6
C	3	2	5

The penalty costs for not satisfying demand at the warehouse D, E, and F are Rs.5, Rs.3, and Rs.2 per unit respectively. Determine the optimal distribution for Kumar, using any of the know algorithm.