B.Com. DEGREE EXAMINATION,APRIL 2020
I Year II Semester
Business Statistics and Operations Research - II

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

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

Answer any **TEN** questions

1. What is Conditional Probability?
2. Define Sampling.
3. What is Null Hypothesis?
4. Give the meaning of unbalanced assignment Problem.
5. Define Critical Path.
6. Four coins are tossed. Find the probability of getting 2 heads and 2 tails.
7. A perfect dice is tossed twice. Find the probability of getting a total of 9.
8. A sample of ten house owners is drawn and the following values of their incomes are obtained. Mean Rs.6,000; standard deviation Rs.650. Test the hypothesis that the average income of house owners of the town is Rs.5,500.Value of t for 9 degrees of freedom at 5% level is 2.262.
9. In 120 throws of a single die, the following distribution of faces was observed.

Face	1	2	3	4	5	6
Frequency	30	25	18	10	22	15

   (The value of χ^2 for 5 degrees of freedom at 5% level is 11.07).
10. Determine an initial basic feasible solution to the following Transportation problem by using North- West corner rule.

		Availability			
Requirements		S1	S2	S3	a_i
	W1	5	4	2	6
	W2	4	7	6	8
	W3	2	5	8	12
	W4	8	6	7	4
	b_j	8	10	12	30

11. A Project consists of 9 jobs A to I with the following precedence relations and estimates of time. Draw a Project Network.

Job	A	B	C	D	E	F	G	H	I
Predecessor	-	-	A,B	A,B	B	D,E	C,F	D,E	G,H
Time (Days)	15	10	10	10	5	5	20	10	15

12. The activities of a Project have the following PERT time estimates.

Job	Optimistic Time	Most Likely Time	Pessimistic Time
1-2	3	6	15
7-8	4	19	28
2-3	6	12	30
3-5	5	11	17
5-8	1	4	7
6-7	3	9	27
4-5	3	6	15
2-4	2	5	8
1-6	2	5	14

Draw the network diagram and determine the critical path.

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

Answer any **FIVE** questions

13. A Sub-committee of 6 members is to be formed out of a group consisting of 7 men and 4 women. Calculate the probability that the sub-committee will consist of,

    1. Exactly 2 women 2. At least 2 women.

14. Discuss the various methods of random sampling and any two of them giving their merits and demerits.

15. The heights of 10 males of a given locality are found to be 175, 168, 155, 170, 152, 170, 175, 160, 160 and 165cms. Based on this sample of 10 items test the hypothesis that the mean height of males is 170cms. (Given $t_{0.05}(9) = 2.76$)

16. Out of 8000 graduates in a town, 800 are females and out of 1600 graduate employees 120 are females. Use chi-square to determine if any distinction is made in appointment on the basis of sex.
    (The table value of χ^2 at 5% level $= 3.84$)

17. Consider a problem of assigning four clerks to four tasks. The times (Hours) required to complete the tasks are given below:

	Tasks				
		A	B	C	D
Clerks	1	4	7	5	6
	2	-	8	7	4
	3	3	-	5	3
	4	6	6	4	2

Clerk 2 cannot be assigned to task A and clerk 3 cannot be assigned to task B. Find the optimum Assignment schedules.

18. Solve the following transportation problem using Vogel's method in order to minimize total transportation cost.

		Destinations					
		D1	D2	D3	D4	D5	Availabilities
Origin	O1	3	5	8	8	11	20
	O2	5	4	10	7	10	40
	O3	2	5	8	7	5	30
	Requirements	10	15	25	30	40	

19. The activities of a project have the following PERT time estimates.

Activity	a (days)	m (days)	b (days)
1-2	12	14	21
1-3	7	10	16
3-5	4	6	10
3-4	36	40	60
4-6	12	15	24
5-6	6	8	12
6-7	9	12	18
6-8	6	10	15
7-8	4	5	7
8-9	8	10	14

Construct the network diagram and find the critical path. Determine the project completion time and its variance.

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

Answer any **TWO** questions

20. A bag contains 4 white and 6 black balls. Two balls are drawn at random. What is the probability that, a) both are white b) both are black c) one white and one black?

21. A sample of 300 students of under graduate and 300 students of post -graduate classes of a university were asked to give their opinion towards the autonomous colleges. 190 of the under graduates and 210 of the post – graduate students favoured autonomous status. Present the above fact in the form of a frequency table and test at 5% level, that opinions of under graduate students on autonomous status of the college are independent. (The value of χ^2 at 5% level is 3.86).

22. A company faced with 2 the problem of assigning 6 different machines and 5 different jobs. The cost of estimated as follows (Rs.100). Solve the problem assuming that the object is minimize the total cost.

	Jobs					
		1	2	3	4	5
Machines	1	2.5	5	1	6	1
	2	2	5	1.5	7	3
	3	3	6.5	2	8	3
	4	3.5	6.5	2	9	4.5
	5	3.5	7	3	9	6
	6	6	9	5	10	6

23. A project scheduling has the following characteristics.

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Days	4	1	1	1	6	5	4	8	1	2	5	7

Summarise the CPM calculations in tabular form and determine the critical path.