M. COM. DEGREE END SEMESTER EXAMINATION - JULY 2021
SEMESTER 2 : COMMERCE
COURSE : **16P2COMT10 : OPERATIONS RESEARCH**
(For Regular - 2020 Admission & Supplementary - 2019/2018/2017/2016 Admissions)

Time : Three Hours   Max. Marks: 75

PART A
Answer any 10 (2 marks each)

1. What is operation research?
2. What is Probabilistic model?
3. An animal feed company must produce at least 200 kgs of a mixture consisting of ingredients X1 and X2 daily. X1 costs Rs. 3 per kg and X2 Rs. 8 per kg. No more than 80kg of X1 can be used atleast 60 kgs of X2 must be used. Formulate the mathematical model to the problem.
4. What are assignment problems?
5. What is an outcome in decision theory?
6. What is pay off matrix?
7. Explain the term arrival pattern in relation to queuing theory.
8. Write notes in action space.
9. What is network analysis? When is it used?
10. What are 'total' 'free' and 'independent' float?
11. What are optimistic, pessimistic and normal time estimates in PERT calculations?
12. What is Interfering Float?

(2 x 10 = 20)

PART B
Answer any 5 (5 marks each)

13. Explain the use of O.R. in management?

14. Show that the following LPP has alternative (multiple) solution.
    Max: $Z = 4X_1 + 4X_2$
    St $X_1 + X_2 \le 6$; $X_1 \le 4$; $X_1 , X_2 \ge 0$

15. An investment group wants to invest up to Rs. 1, 00, 00,000 into various bonds. They are currently considering four bonds; details on return and maturity time are as given below.

Bond	Type	Return	Maturity time
A	Industrial	10%	10 years
B	Industrial	12%	3 years
C	Government	15%	8 years
D	Government	5%	4 years

The group has decided not to put less than half of its investment in the Government bonds and that the average of the portfolio should not be more than 6 years. The investment should be such which maximizes the return of their investment, subject to the above restrictions.

16. Find the initial feasible solution to the transportation problem given below, by North West Corner Rule

Origin	Destination			Supply
	D1	D2	D3	
O1	2	7	4	5
O2	3	3	1	8
O3	5	4	7	7
tO4	1	6	2	14
Demand	7	9	18	

17. How are prohibited assignment problems solved?

18. What are the assumptions and limitations of game theory?

19. Explain :
a) Maximax
b) Minimax
c) Maximin decision criteria

20. Draw a network for the project whose activities and their precedence relationships are given below.

Activity:	A	B	C	D	E	F
Predecessor:	...	....	.....	A,B	A,C	B,C

(5 x 5 = 25)

PART C
Answer any 3 (10 marks each)

21. Comment on the following statements:
a) O.R. is the art of winning war without actually fighting it.
b) O.R. is the art of finding bad answers where worse exits.

22. Solve the following Linear Programming Problems by Simplex Method.
Max. $Z = X_1 + X_2$
S.t. $X_1 + 2X_2 \leq 2000$
$X_1 + X_2 \leq 1500$
$X_2 \leq 600$
$X_1, X_2, \geq 0$

23. Solve the minimal assignment problem.

job	man			
	A	B	c	D
1	12	30	21	15
2	18	33	9	31
3	44	25	21	21
4	14	30	28	14

24. A firm owner is seriously considering to drill a farm well. In the past, only 70% of wells drilled were successful at 200 feet of depth in the area. Moreover, on finding no water at 200 ft., some persons drilled it further up to 250 feet but only 20% struck water at 250ft. The prevailing cost of driling is Rs 50 per foot. The farm owner has estimated that in case he does not get his own wells, he will have to pay Rs 15,000 over the next 10 years, in present value (PV) term, to buy water from the neighbour. The following decisions can be optimal.

(i)Do not drill any well (ii) drill up to 200ft and (iii) if no water is found at 200 ft. drill further up to 250ft.
Draw an appropriate decision tree and determine the farm owner's strategy under EMV approach.

25. For a small project consisting of eight activities estimates are given below.

Activity	Estimated duration (weeks)		
	Pessimistic	Most likely	Optimistic
1 to 2	21	7.5	3
1 to 3	27	8	3
2 to 4	8	8	8
2 to 5	3.5	2	0.5
3 to 5	10	10	10
4 to 5	1.7	1	0.3
4 to 6	9	7.5	3
5 to 6	5	3	1

a) Draw the project network and identify all paths through it.
b) What is the expected project completion time.
c) Find the approximate probability of completing the project no more than 4 weeks later than expected.
d) Find the due date if there is 90% chance to meet this date.

(10 x 3 = 30)