STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI - 600 086
(For candidates admitted from the academic year 2015-16 & thereafter)

SUBJECT CODE : 15MT/AE/OR45

B.A./ B.C.A./ B.Com./ B.Sc. DEGREE EXAMINATION, APRIL 2018
FOURTH SEMESTER

COURSE : ALLIED ELECTIVE
PAPER : OPERATIONS RESEARCH
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION – A

ANSWER ALL THE QUESTIONS: **(10×2=20)**

1. Define operation research.
2. Write the dual of the following linear programming problem.
   Max $Z = 3x_1 + 4x_2$ subject to $2x_1 + 3x_2 \leq 16$, $5x_1 + 2x_2 \geq 20$, $x_1, x_2 \geq 0$.
3. Under what condition transportation problem is unbalanced?
4. Define optimal solution in transportation problem.
5. Describe the mathematical model for the assignment problem.
6. Write down the difference between transportation and assignment problems.
7. Define two-person zero-sum game.
8. Define a saddle point.
9. When do you use dummy activities in project network?
10. Define free float.

SECTION – B

ANSWER ANY FIVE QUESTIONS: **(5×8=40)**

11. A company has three operational departments (weaving, processing and packing) with capacity to produce three different types of clothes namely suiting, shirting and woolens yielding the profit Rs. 2, Rs. 4 and Rs. 3 per metre respectively. One metre suiting requires 3 minutes in weaving, 2 minutes in processing and 1 minute in packing. Similarly one metre of shirting requires 4 minutes in weaving, 1 minute in processing and 3 minutes in packing while one metre woolen requires 3 minutes in each department. In a week, total run times of each department are 60, 40 and 80 hours of weaving, processing and packing departments respectively. Formulate the linear programming problem to find the product mix to maximize the profit.

12. Use least cost method to find the initial solution for the following transportation problem.

FACTORY	WAREHOUSE				Supply
	W_1	W_2	W_3	W_4	
F_1	21	16	25	13	11
F_2	17	18	14	23	13
F_3	32	27	18	41	19
Demand	6	10	12	15	43

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13. Five computers are available to do five different jobs. From past records, the time that each computer takes to do each job is known and given in the following table:

COMPUTER	JOB				
	I	II	III	IV	V
A	2	9	2	7	1
B	6	8	7	6	1
C	4	6	5	3	1
D	4	2	7	3	1
E	5	3	9	5	1

Find the assignment of computers to jobs that will minimize the total time taken.

14. Given below is the pay-off matrix in respect of a two-person zero-sum game:

	B_1	B_2	B_3	B_4	B_5
A_1	8	10	-3	-8	-12
A_2	3	6	0	6	12
A_3	7	5	-2	-8	17
A_4	-11	12	-10	10	20
A_5	7	0	0	6	2

(i) Write down the maximin and minimax strategies, (ii) What is the value of the game? (iii) Is this game a fair one?

15. Elucidate a few management applications in network analysis.

16. Write down the characteristics of the dual problem and the advantages of duality.

17. Construct the project network for the following relationships.

Activity	A	B	C	D	E	F	G
Immediate predecessor	-	-	A	A	B	C	D, E

SECTION – C

ANSWER ANY TWO QUESTIONS: (2x20=40)

18. (a) Solve by graphical method: Min $Z = 20x_1 + 40x_2$ subject to $36x_1 + 6x_2 \geq 108$, $3x_1 + 12x_2 \geq 36$, $20x_1 + 10x_2 \geq 100$, $x_1, x_2 \geq 0$. (10)

(b) Solve the following unbalanced assignment problem. (10)

OPERATOR	JOB				
	I	II	III	IV	V
A	6	2	5	3	6
B	2	5	8	7	7
C	7	8	6	9	8
D	6	2	3	4	5
E	9	3	8	9	7
F	4	7	4	6	8

19. A cement factory manager is considering the best way to transport cement from her three manufacturing centers P, Q, R to depots A, B, C, D, E. The weekly production and demands along with transportation costs per tonne are given below:

	A	B	C	D	E	Supply
P	4	1	3	4	4	60
Q	2	3	2	2	3	35
R	3	5	2	4	4	40
Demand	22	45	20	18	30	

What should be the distribution programme? (20)

20. (a) Use dominance principle to solve the following game. (10)

	b_1	b_2	b_3	b_4	b_5
a_1	4	6	5	10	7
a_2	6	7	4	8	9
a_3	9	8	10	9	8

(b) A small project consisting of 12 activities has the following characteristics in days. (10)

Activity	Most optimistic time	Most likely time	Most pessimistic time
1 - 2	4	8	12
2 - 3	1	4	7
2 - 4	8	12	16
3 - 5	3	5	7
4 - 5	0	0	0
4 - 6	3	6	9
5 - 7	3	6	9
5 - 8	4	6	8
7 - 9	4	8	12
8 - 9	2	5	8
9 - 10	4	10	16
6 - 10	4	6	8

Determine (i) Expected task time and their variance, (ii) Critical path.