K19P 0004

Reg. No. : ....

Name : ....

Fifth Semester M.C.A. Degree (Reg./Supple./Imp.) Examination, January 2019
(2014 Admission Onwards)
Elective – III : MCA 5E 09 : OPERATIONS RESEARCH

Time : 3 Hours   Max. Marks : 80

Instructions : *1) Answer **any ten** questions from Section – **A. Each** question carries **three** marks.*

*2) Answer **all** questions from Section – **B. Each** question carries **ten** marks.*

SECTION – A

Note : Answer **any ten** questions. **Each** question carries **three** marks.

1. Write down the standard form of a LPP.
2. How to find the dual of a given primal ?
3. Write the mathematical formulation of a transportation problem.
4. What is the optimality criterion in the assignment problem ?
5. List the characteristics of dynamic programming problem.
6. Write the mathematical modelling of integer programming problem.
7. Explain briefly the branch and bound method.
8. What is meant by "no passing rule" in sequencing ?
9. What are the assumptions in sequencing problem ?
10. Distinguish between CPM and PERT.
11. What is queue discipline ?
12. Define Markov chain. Give an example. **(10×3=30)**

P.T.O.

SECTION – B

Note : Answer **all** questions. **Each** question carries **ten** marks.

13. a) Solve using Big-M method.

Max. $Z = -2X_1 - X_2$

subject to the constraints

$3X_1 + X_2 = 3$

$4X_1 + 3x_2 \geq 6$

$X_1 + 2X_2 \leq 4$

where $X_1, X_2 >= 0$. **10**

OR

b) Solve the following LPP using two-phase simplex method :

Maximize $Z = 5x_1 - 4x_2 + 3x_3$

subject to $2x_1 + x_2 - 6x_3 = 20$

$6x_1 + 5x_2 + 10x_3 \leq 76$

$8x_1 - 3x_2 + 6x_3 \leq 50$

$x_1, x_2, x_3 \geq 0$. **10**

14. a) Solve the following LPP using dual Simplex method :

Maximize $Z = 5x + 6y + z$

Subject to the constraints

$9x + 3y - z <= 5$

$4x + 2y - z <= 2$

$x - 4y + z <= 3$

where $x, y, z >= 0$. **10**

OR

b) There are five jobs to be assigned, one each to 5 machines and the associated cost matrix is as follows. Solve the problem to maximise the profit.

		Machine				
		1	2	3	4	5
Jobs	A	40	40	35	25	50
	B	42	30	16	25	27
	C	50	48	40	60	50
	D	20	19	20	18	25
	E	58	60	59	55	53

10

15. a) Solve the IPP by cutting-plane method.

Minimize $4x_1 + 5x_2$

subject to $3x_1 + x_2 \geq 2$

$x_1 + 4x_2 \geq 5$

$3x_1 + 2x_2 \geq 7$

x_1, x_2 non-negative integers. 10

OR

b) Solve the following problem using branch and bound method.

Minimize $f = 3x_4 + 4x_5 + 5x_6$

Subject to $2x_1 + 2x_4 - 4x_5 + 2x_6 = 3$

$2x_2 + 4x_4 + 2x_5 - 2x_6 = 5$

$x_3 - x_4 + x_5 + x_6 = 4$

$x_1, x_2, ..., x_6 \geq 0$; x_1, x_2 integers. 10

16. a) Solve the following sequencing problem giving an optimal solution when passing out is not allowed.

Machine	Job				
	A	B	C	D	E
M_1	11	13	9	16	17
M_2	4	3	5	2	6
M_3	6	7	5	8	4
M_4	15	8	13	9	11

10

OR

b) Assuming that the expected time are normally distributed, find the critical path and project duration of :

Activity	Days		
	Optimistic time	Most likely time	Pessimistic time
1 – 2	2	5	14
1 – 3	9	12	15
2 – 4	5	14	17
3 – 4	2	5	8
3 – 5	8	17	20
4 – 5	9	9	12

10

17. a) i) Briefly explain the queuing model (M/M/1) (∞/FCFS) (Birth and death model). **5**

ii) Explain the classification of stochastic process. **5**

OR

b) Arrivals at a telephone booth are considered to be Poisson with an average time of 10 minutes between one arrival and the next. The length of a phone call assumed to be distributed exponentially with mean 3 minutes.

i) What is the probability that a person arriving at the booth will have to wait ?

ii) What is the average length of the queue that forms from time to time ?

iii) The telephone department will install a second booth when convinced that an arrival would expect to have to wait at least three minutes for the phone. By how much must the flow of arrivals be increased in order to justify a second booth ? **10**