K16U 0517

Reg. No. : .....

Name : .....

IV Semester B.C.A. Degree (CCSS – Supple./Imp.) Examination, May 2016
COMPLEMENTARY COURSE IN MATHEMATICS FOR BCA
4C04 MAT (BCA) : Operation Research
(2013 and Earlier Admissions)

Time : 3 Hours Max. Weightage : 30

Answer **all** questions. Weightage for a bunch of **4** questions is **1**.

1. Fill in the blanks :
   a) Any feasible solution which optimizes the objective function is called its _____
   b) A basic feasible solution of a linear programming problem is said to be _____ if at least one of the basic variables is zero.
   c) The shadow price is also called _____
   d) An assignment problem is called an _____ assignment problem whenever the number of tasks is not equal to the number of facilities.
   e) Usually a job or task requires time and cost. But there are certain activities which do not take time or resources. They are known as _____ activities.
   f) The name of the probability distribution used in PERT which estimates the expected duration and expected variance of the activity is _____
   g) The dynamic programming technique was developed by _____ in 1950.
   h) _____ is a problem of determining an appropriate order for a series of jobs to be done on a finite number of service facilities so as to minimise the total time taken for finishing all the jobs. **(Wt. 2×1=2)**

Answer **any 6** questions (Weightage **1 each**).

2. What are slack and surplus variables ?
3. Give the economic interpretation of dual.
4. Distinguish between CPM and PERT.

P.T.O.

5. Write the mathematical formulation of a TP.
6. What is meant by travelling sales man problem ?
7. What do you understand by degeneracy in transportation problem ?
8. Write any 4 characteristic of DPP.
9. Give the difference between DP and LP.
10. What are the assumptions in sequencing problem ? **(Wt. 6×1=6)**

Answer **any 7** questions (Wt. **2 each**).

11. What are the characteristics of the dual problem ?
12. Find the initial feasible solution to the TP given below by north west corner rule.

	Destination			
Origin	D_1	D_2	D_3	**Supply**
O_1	2	7	4	5
O_2	3	3	1	8
O_3	5	4	7	7
O_4	1	6	2	14
Demand	7	9	18	

13. Give the mathematical formulation of assignment problem.
14. What are optimistic, pessimistic and normal time estimates in PERT calculations ?
15. Use Branch and Bound technique, solve the following :

    Max : $Z = 2x_1 + 2x_2$

    S.t. $5x_1 + 3x_2 \leq 8$

    $x_1 + 2x_2 \leq 4$

    $x_1, x_2 \geq 0$ and integers

    (Use graphic method to solve the LPP).
16. Use Bellman's principle of optimality to find the optimum solution :

    Maximize $Z = x_1.x_2.x_3$

    S.t. $x_1 + x_2 + x_3 = 5$

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

17. A company has 3 jobs on hand. Each of these must be processed through two departments, the sequential order for which Department A – Press Shop, Department B – Finishing :

	Job I	Job II	Job III
Department A	8	6	5
Department B	8	3	4

Find the sequence in which 3 jobs should be processed so as to take minimum time to finish all the 3 jobs. What are minimum i) Total time ii) Idle time of both departments ?

18. Solve graphically the following linear programming problem :

Minimize $Z = 3x_1 + 5x_2$

Subject to $3x_1 + 4x_2 \leq 12$

$2x_1 - x_2 \geq -2$

$2x_1 + 3x_2 \geq 12$

$x_1 \leq 4, x_2 \geq 2 \quad x_1, x_2 \geq 0.$

19. Solve using simplex method :

Maximise $Z = 5x_1 + 3x_2$

S.t. $x_1 + x_2 \leq 2$

$5x_1 + 2x_2 \leq 10$

$3x_1 + 8x_2 \leq 12, x_1, x_2 \geq 0.$

20. Find the dual of the following primal :

Min. $Z = 4x_1 + 2x_2 + x_3$

S.t. $x_1 + x_2 \leq 10$

$3x_1 + x_2 + x_3 \geq 23$

$7x_1 - x_3 = 6$

$x_1, x_2, x_3 \geq 0.$

21. Solve using Big–M method :

Min. $Z = 5x_1 + 6x_2$

S.t. $2x_1 + 5x_2 \geq 1500$

$3x_1 + x_2 \geq 1200$

$x_1 \geq 0, x_2 \geq 0.$

(Wt. 7×2=14)

Answer **any 2** questions (Wt. **4 each**) :

22. Solve by two phase simplex method :

Min. $Z = 6x_1 + 5x_2$

S.t. $2x_1 + x_2 \geq 80$

$x_1 + 2x_2 \geq 60$; $x_1, x_2 \geq 0$.

23. Solve the following TP whose cost matrix availability at each plant and requirements at each warehouse are given below as follows :

	Warehouse				
Plant	W_1	W_2	W_3	W_4	**Availability**
P_1	190	300	500	100	70
P_2	700	300	400	600	90
P_3	400	100	600	200	180
Requirements	50	80	70	140	

24. The following table gives activities in a construction project and other relevant information :

Activity :	1 – 2	1 – 3	2 – 3	2 – 4	3 – 4	4 – 5
Duration :	20	25	10	12	6	10

i) Draw the network for the project.

ii) Find free, total and independent floats for each activity.

iii) Which are the critical activities ? **(Wt. 2×4=8)**