KATHMANDU UNIVERSITY
End Semester Examination [C]
May/June, 2019

Marks Scored:

Level : B.Sc.
Year : III

Course : COMP 317
Semester : I

Exam Roll No.:

Time: 30 mins.

F.M. : 10

Registration No.:

Date 02 :JUN 2019

SECTION "A"
[10 Q. × 0.5 = 5 marks]

Fill in the blank(s) (question number 1 through 10) by the most appropriate word(s) or symbol(s):

1. Traffic intensity for M/M/s queueing model is .....

2. Slack variable $s_2 = 10$ indicates that.....

3. The complementary slackness is the relation between .....

4. Random number generation is made by using the formula .....

5. After Big M-method ..... is another method to solve a given LPP involving some artificial variables?

6. If one of $d_{ij} = 0$ in final optimal solution of transportation problem indicates that the problem has .....

7. Generally, the best performance of initial method of transportation problem is ....

8. The formula $E_j - E_i - t_{i\,j}$ in networking planning calculates the .....

9. Duality of LP problem is solved in the case when.....

10. Kendall's notation A/B/C: D/E/F where F stands for .....

SECTION "B"
[10 Q. × 0.5 = 5 marks]

Fill in the blank spaces (Question number 11 through 20) by choosing the most appropriate answers from among the given ones. Do not tick the answers.

11. While solving LP problem by simplex method ,while determining minimum ratio the situation come to have infinity that leads to the problem to have ..... solution
[Infeasible, optimal, unbounded, multiple]

12. Dual constraints for the maximization LP-problem is .....
[$\sum a_{ij}\, y_i \geq C_j$, $\sum a_{j\,i}\, y_i \geq C_j$, $\sum a_{ij}\, y_j \leq C_j$, $\sum a_{ji}\, y_i \leq C_j$,]

13. On the critical path of network ..... holds
(i) $E_j - E_i = L_j - L_i = t_{i\,j}$ (ii) $E_j - L_j - E_i = L_i - t_{i\,j}$
(iii) $E_i - E_j - L_i = E_i - t_{i\,j}$ (iv) $E_i - L_i = E_j - L_j = t_{i\,j}$

14. Indication of existence of multiple solution by simplex method is that .....
.....
(i) Element of $Z_j - C_j$ row corresponding to basic variable is zero
(ii) Element of $Z_j - C_j$ row corresponding to non-basic variable is zero
(iii)Element of $Z_j - C_j$ row corresponding to slack variable is zero
(iv)Element of $Z_j - C_j$ row corresponding to surplus variable is zero

15. In two phase method, II-phase is used to find .....
[Feasible optimal solution, feasible solution,
multiple solutions, whether feasible solution exists]

16. Very LPP is associated with another LPP is called .....
a. Primal b. Dual
c. Non-linear programming d. stochastic programming

17. Branch and bound method of integer programming problem is referred to .....
.....
a. Adding a constraint,
b. Removing a constraint,
c. Either adding or removing a constraint,
d. Removing constraint and extending the feasible solution region

18. Min $Z = 6x_1 + 4x_2 + 8x_3$ subject to the constraints $x_1 + x_2 \geq 5, x_2 \geq 8, 9x_1 + 10x_2 \leq 15$; $x_1, x_2, x_3 \geq 0$ has the auxiliary objective function for two phase method is .....
.....
[Min Z = $-A_1 - A_2 - A_3$, Max Z = $-A_1 - A_2$,
Min Z = $A_1 + A_2$, Max Z = $A_1 * A_2$]

19. The rate by objective function value improves as the R.H.S quantity is increased by unity is called .....
[Reduced cost, Opportunity cost, Relative cost, Dual price]

20. Which one is not the terminology of integer programming problem?.....
a. Node b. Fathom
c. Gomary's c utting plane d. Branch and bound

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SECTION "C"

[3 Q × 7 = 21 marks]

1. Who are the impatient customers in the queueing system? A postal clerk can service a customer in 3 minutes; the service time being exponentially distributed. The inter-arrival time of customers is also exponentially distributed with an average of 12 minutes. [1+2+2+2]

   a) Find the average queue length.
   b) Find the expected waiting time in the queue.
   c) Find the probability that there are more than 2 in the system.

2. A hydro dam consulting company considering a new computer system for accounting and inventory control. A computer company sent the following information about the computer installation: [3+2+2]

			Times(days)
A	Select the computer model	---	10
B	Design input/output systems	A	10
C	Design monitoring systems	B	10
D	Assemble computer hardware	B	6
E	Develop the main programs	B	12
F	Develop input/output routines	C	10
G	Create data base	C	6
H	Install the system	F,G	8
I	Test and packaging	D,E,H	16
J	Supply to branch restaurants	I	12

   a) Construct the network diagram for the project
   b) Find the expected completion time of the project
   c) Find the total floats for all the non-critical activities

3. The ABC Company wishes to plan its advertising strategy. There are two media under consideration, The Himalayan Times (THT) and Kantipur daily. The Himalayan Times has a reach of 2,000/- potential customers and Kantipur daily has a reach of 2,500/- potential customers. The cost per page of advertising is R.400/- and Rs 600 /-in THT and Kantipur daily respectively. The firm has a monthly budget of Rs.6,000/- .There is an important requirement that the total reach for the income group under Rs.20,000/- per annum should not exceed 4,000/- potential customers .The reach in papers THT and Kantipur daily for this income group is 400/- and 200/- potential customers.(a) Set up the Mathematical model as the linear programming problem (b) Find by graphical method that how many pages should be bought in the two News papers to maximize the total reach. [3.5+3.5]

OR

What is the significance of Big-M that is used in Big-M technique of Simplex method? Find the optimal solution of the following LP-problem by using this method. [1+6]

Minimize $Z = 60x_1 + 80x_2$ subject to $x_1 \leq 400$

$x_2 \geq 200$

$x_1 + x_2 = 500$

$x_1, x_2 \geq 0$

SECTION "D"

[5 Q × 5 = 25 marks]

4. What sort of LP problem does the dual-simplex method solve? By using this method find the optimal solution of following LP-problem: [1+4]

Maximize $Z = -2x_1 - x_3$ subject to $x_1 + x_2 - x_3 \geq 5$

$x_1 - 2x_2 + 4x_3 \geq 8$

$x_1, x_2, x_3 \geq 0$

5. When do we enter phase II in the process of solving LP-problem by Two –Phase Method? Find the optimal solution of the following LP-problem by using Two-phase method: [1+4]

Maximize $Z = 2x_1 + 3x_2 + 4x_3$ subject to $3x_1 + x_2 + 4x_3 \leq 600$

$2x_1 + 4x_2 + 2x_3 \geq 480$

$2x_1 + 3x_2 + 3x_3 = 450$

$x_1, x_2, x_3 \geq 0$

OR

Show that the necessary and sufficient condition for a set S to be convex is that every convex linear combination of points in S belongs to S.

6. A company has factories at different places P_1, P_2, P_3, P_4 which supply items to warehouses A, B, C, D, E. Monthly factory capacities are 200, 175, 150, 325, respectively. Monthly warehouse requirements are 110, 90, 120, 230, and 160, respectively. Unit shipping costs (in rupees) are given in the following table: Find optimal distribution plan of items by using initial solution by Vogel's Approximation solution. [5]

Place ↓	Warehouse				
	A	B	C	D	E
P_1	11	31	---	9	15
P_2	12	10	12	21	11
P_3	25	11	12	17	15
P_4	10	21	13	---	17

7. In a textile sale - stock, four salesman A, B, C and D are available to four counters W, X, Y and Z. Each salesman can handle any counter. The service (in hour) of each counter when manned by each salesman is given below:

Place ↓	A	B	C	D
w	41	72	39	52
X	22	29	49	65
Y	27	39	60	51
Z	45	50	48	52

How should the salesman be allocated appropriate counters so as to minimize the service time? Each salesman must handle only one counter. [5]

8. In a single channel queuing system random numbers for arrivals of customers are 18,81,19,50,96 and random numbers for services of customers are 20,88,05,75,92, system starts at 10:00 a.m. and using Monte Carlo simulation for the queuing system with the help of table given below: Find [5]
(i) Mean queue length.
(ii) Mean inter arrival time of a customer
(iii)Mean service time of a customer.
(iv)Mean idle time of server.
(v) Mean time that a customer spends in the system

Inter-arrival time (min)	Probability	Service time (min)	Probability
5	0.05	7	0.15
6	0.35	6	0.35
7	0.40	9	0.30
8	0.20	15	0.20

SECTION "E"

[2Q × 2 = 4 marks]

9. Discuss the integer programming problem
10. Explain the degeneracy that takes place in solution of LP-problem and transportation problem.