KUMARAGURU
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Register Number: ……..

B.TECH DEGREE EXAMINATIONS: NOV 2015

(Regulation 2009)

Seventh Semester

INFORMATION TECHNOLOGY

GSS108: Operations Research

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 1 = 10 Marks)

1. Linear programming problems of ---------- can be solved by graphical method
   a) two decision variable b) three decision variable
   c) four decision variable d) One decision variable

2. In a maximization problem the optimum is reached where the Z – row coefficients of the non basic variables are
   a) negative b) nonnegative
   c) negative and zero d) negative and non negative

3. The cost matrix of the transportation problem should be
   a) a square matrix b) number of columns should be more
   c) number of rows should be more d) at any form

4. The availability and the demand in a transportation problem
   a) should not be equal b) demand should be more
   c) should be equal d) availability should be more

5. In PERT analysis, the variance of a job having optimistic time 5,most likely time 8 and pessimistic time 17 is
   a) 8 b) 7
   c) 9 d) 14

6. For an activity, the normal time is 8 days, normal cost is 100, crash time is 6 days and crash cost is Rs. 200. The cost – time slope for this activity is
   a) 50 b) 100
   c) 150 d) 75

7. If there are 4 tasks to perform, each of which requires processing on 2 different machines, the number of theoretically possible sequences is
   a) $(4)^2$ b) 4 X 2
   c) 4! d) $(4!)^2$

8. The algorithm used to find the optimal sequence of n jobs through two or three machines is due to

a) Fulkerson b) Floyd's

c) Dijkstran d) Johnson

9. When the system has a number of parallel service channels each with one server, the Queuing model is called

a) Multi server model b) Single server model

c) Single Queue d) Multi Queue

10. A server takes 3 minutes to serve a customer, customers arrives at the rate of 10/hour, find ρ.

a) 1 b) 2

c) 1/2 d) 3/4

PART B (10 x 2 = 20 Marks)

11. Give a graphical example of infeasible solution.
12. Differentiate Big M and II phase methods.
13. At what condition a transportation model is said to have an alternate solution.
14. What is the major constraint of assignment models?
15. State Fulkerson's rule of networking.
16. Differentiate CPM and PERT.
17. Write the condition for Johnson's algorithm to be applicable in finding the optimal sequencing order of n jobs through 3 machines.
18. When do we replace the machine considering the time *t* as a discrete variable and ignoring changes in the value of money?
19. Define Kendal's notation to specify the queuing system.
20. Define arrival distribution, inter arrival time and arrival rate.

PART C (5 x 14 = 70 Marks)

21. a) Solve the following LPP by graphical method Maximize $Z = 3X_1 + 5X_2$ subject to

$$-3X_1 + 4X_2 \leq 12$$
$$2X_1 - X_2 \geq -2;$$
$$2X_1 + 3X_2 \geq 12;$$
$$X_1 \leq 4;$$
$$X_2 \geq 2;$$
$$X_1, X_2 \geq 0$$

(OR)

b) Using the simplex method, solve the following problems

Max, $Z = x_1 + x_2 + 3x_3$

Subject to

$3x_1 + 2x_2 + x_3 \leq 3$

$2x_1 + x_2 + 2x_3 \leq 2$ $\quad x_1, x_2 \& x_3 \geq 0$

22. a) Obtain the initial solution for the following transportation problem using Vogel's approximation method: and find the optimal solution using MODI method.

		Destination			
		A	B	C	Supply
	1	2	7	4	5
Origin	2	3	3	1	8
	3	5	4	7	7
	4	1	6	2	14
	Demand	7	9	18	34

(OR)

b) Solve the following assignment problem.

	TASK					
Machine		A	B	C	D	E
	M1	4	6	10	5	6
	M2	7	4	NOT SUITABLE	5	4
	M3	NOT SUITABLE	6	9	6	2
	M4	9	3	7	2	3

23. a) Construct the network for the project whose activities are given below and compute the total float of each activity and hence determine the critical path and the project duration.

Activity	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
Duration (in weeks)	3	8	12	6	3	3	8	5	3	8

(OR)

b) A project consists of 8 activities with following information.

ACTIVITY	IMMEDIATE PREDECESSOR	OPTIMISTIC TIME DURATION	MOST LIKELY TIME DURATION	PESSIMISTIC TIME DURATION
A	-	1	1	7
B	-	1	4	7
C	-	2	2	8
D	A	1	1	1
E	B	2	5	14
F	C	2	5	8
G	D,E	3	6	15
H	F,G	1	2	3

i. Draw PERT network and find out the expected project completion time.
ii. What duration will have 95% surety of project completion?
iii. If the average duration for activity F increases to 14 weeks, what will be its effect on expected project completion time, which has 95% surety?

24. a) Suppose several types of furniture must pass through three pre finishing stages in the same order. Because of the size and complexity of each type of furniture, the processing time at each stage varies considerably. Determine an optimal sequence for processing the five types of furniture, the total elapsed time and ideal time at stages 1, 2 and 3.

Type	Stage 1	Stage 2	Stage 3
Chair	7	2	5
Desk	10	3	8
Lamp	6	4	4
End Table	7	3	2
Coffee Table	8	5	2

(OR)

b) A machine shop has a press which is to be replaced after it wears out. A new press is to be installed now. Further an optimum replacement is to be found for next 7 years after which the press is no longer required. The following data is given:

Year	Installation cost at beginning of year (Rs)	Salvage Value at end of year (Rs)	Operating cost during the year (Rs)
1	200	100	60
2	210	50	80
3	220	30	100
4	240	20	120
5	260	15	150
6	290	10	180
7	320	0	230

Find the optimum replacement plan and the corresponding minimum cost.

25. a) (a) A general Insurance company has three claim adjusters in its branch office. People with claims against the company are found to arrive in Poisson fashion at an average rate of 20 per 8 – hour day. The amount of time that an adjuster spends with a claimant is found to have negative exponential distribution with mean service time 40 minutes. Claimants are processed in the order of their appearance.

(i) How many hours a week can an adjuster expect to spend with claimants?

(ii) How much time, on the average, does claimant spend in the branch office?

(OR)

b) Workers come to store room to enquire about special tools for accomplishing a particular project assigned to them. The average time between two arrivals is one minute and the arrivals are assumed to be in Poisson's distribution. The average service time of the tool room attendant is 40 seconds. Determine

(a) average queue length
(b) average number of workers in system
(c) mean waiting time of an arrival in the queue
(d) Average time that a worker spends in the store room.

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