Total No. of Questions : 12]

SEAT No. :

P1508

[Total No. of Pages : 6

[4759]-5
B.E. (Civil)
SYSTEM APPROACH IN CIVIL ENGINEERING
(2008 Course) (Elective-I) (Semester-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***

SECTION-I

Q1) a) Use Graphical method to solve following LP Problem **[6]**

Minimize $Z = 3x_1 + 2x_2$

Subject to constraints $5x_1 + x_2 \geq 10$

$$x_1 + x_2 \geq 6$$

$$x_1 + 4x_2 \geq 12$$

$$x_1, x_2 \geq 0$$

b) Use Two Phase method to solve following LP Problem **[12]**

Minimize $Z = x_1 + x_2$

Subject to constraints $2x_1 + x_2 \geq 4$

$$x_1 + 7x_2 \geq 7$$

$$x_1, x_2 \geq 0$$

OR

P.T.O.

Q2) a) Use Big-M method to solve the following LP Problem **[12]**

Minimize $Z = 5x_1 + 3x_2$

Subject to constraints $2x_1 + 4x_2 \leq 12$

$$2x_1 + 2x_2 = 6$$

$$5x_1 + 2x_2 \geq 10$$

$$x_1, x_2 \geq 0$$

b) Explain in brief various models used in System Approach? **[6]**

Q3) a) A company has factories at F_1, F_2, F_3 which supply to warehouses at W_1, W_2, W_3. Weekly factory capacities are 200, 160 & 90 units resp. Weekly warehouse requirement are 180, 120 & 150 units resp. Unit shipping cost are as follows: **[12]**

Warehouse

Factory	W_1	W_2	W_3	Supply
F_1	16	20	12	200
F_2	14	8	18	160
F_3	26	24	16	90
Demand	180	120	150	450

Determine the optimal distribution for this company to minimize total shipping cost? (Use Modi's Method)

b) Explain procedure in detail Hungarian method to solve assignment problem. **[4]**

OR

Q4) a) Six wagons A, B, C, D, E & F are available at six stations S_1, S_2, S_3, S_4, S_5, S_6. Mileages between various stations are given below: **[12]**

Wagon	Station					
	S_1	S_2	S_3	S_4	S_5	S_6
A	30	33	28	20	26	30
B	60	30	27	26	25	21
C	70	40	50	65	18	17
D	16	17	20	30	110	19
E	28	29	38	27	70	80
F	19	20	30	40	50	65

How should the wagons be transported so as to minimize the total mileage covered?

b) What do you mean by assignment model? Write down it's applications. **[4]**

Q5) a) It is proposed to develop Hydropower by building dams across 3 possible river Sites. Total financial available is 8 Money units. The return functions for each of Possible investment are given below. The available resource is to be allocated Optimally to these developments. Using DP determine maximum return and give Allocation to various sites. **[12]**

Resource allocated	Return from site		
	1	2	3
0	0	0	0
2	12	14	30
4	75	55	50
6	91	70	70
8	98	80	75

b) What is dynamic programming? State Bellman's Principal of optimality? **[4]**

OR

Q6) a) Give procedure adopted in analysis of Dynamic Programming Problems. **[4]**

b) A Project Management Consultant has offers From 3 different clients for his services, each client is willing to employ a consultant for as many days as he is prepared to give for the fees shown in following table. How many days should the consultant devote to each client to maximize his income per week if the consultant works for 5 days a week. **[12]**

No. of days	Clients		
	Client-1	Client-2	Client-3
0	0	0	0
1	1	1.25	1.5
2	2.5	2.5	3
3	4	3.75	4
4	5.25	5	5.5
5	6	6.25	6.5

SECTION-II

Q7) a) Using Lagrange's Multiplier Method solve **[9]**

Minimize $f(x) = \frac{18}{x_1\ x_2}$

Subject to $x_1^2 + x_2^2 = 9$

b) Using Newton's Modified method **[9]**

minimize $f(x) = 2x_1^2 + 2x_1x_2 + 2x_2^2 - 4x_1 - 6x_2$

Taking $x^0 = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$

OR

Q8) a) Using steepest gradient method solve **[9]**

Minimize $Z = (x_1 - x_2)^2 + 2(x_2 - 1)^2$

Starting $x^0 = \begin{bmatrix} 2 \\ -1 \end{bmatrix}$

b) Using Fibonnaci method solve

Minimize $Z = x^3 - 108x$ in the range (0, 10) with an accuracy 0.1%. **[9]**

Q9) a) Write a short note on - Queuing Model. **[4]**

b) Solve the following sequencing problem involving 3 machine n-jobs & no passing, to obtain the sequence of jobs to be processed so as to minimize the total time lapsed. Determine the total elapsed time and idle hours of machines, if any. Tabulate results indicating schedule of processing of all job. **[12]**

Jobs	Time in Hours		
	Machine A	Machine B	Machine C
1	6	5	9
2	7	7	11
3	3	8	8
4	4	5	9
5	5	6	12
6	10	4	9
7	16	7	10
8	12	3	11

OR

Q10)a) A sample of 200 arrivals of customers in Supermarket is according to the following distribution **[12]**

Time between arrivals in Min	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5
Frequency	4	12	22	48	38	28	22	12	8	4	2

The Time taken for service follow the distribution

Time in Min	0.5	1	1.5	2	2.5	3	3.5	4
Frequency	12	18	38	60	32	16	14	10

Estimate the average % waiting time and idle time of customer by simulation for next 10 arrivals.

Use following random numbers

Arrivals	09	73	25	33	76	53	01	35	86	34
Service	54	20	48	05	64	89	47	42	96	24

b) Write applications of following **[4]**

i) Simulation.

ii) Queuing Theory.

Q11)a) Solve the following game by method of Dominance. **[10]**

Player B

$$\text{PlayerA} \begin{bmatrix} 3 & 5 & 4 & 9 & 6 \\ 5 & 6 & 3 & 7 & 8 \\ 8 & 7 & 9 & 8 & 7 \\ 4 & 4 & 8 & 5 & 3 \end{bmatrix}$$

b) Write short note on Replacement Model. **[6]**

OR

Q12)a) Purchase price of a machine is Rs. 60000. The installation charges amount to Rs. 12400 & it's scrap value is only Rs. 3400. The maintenance cost in various years is given below. **[10]**

Year	1	2	3	4	5	6	7	8
Maintenance cost	1000	2500	3500	4500	7500	9500	14500	16500

After how many years should the machine is replaced? Assume that the machine replacement can be done only at the year ends?

b) Explain Two-Person zero sum Game. Distinguish between pure strategy & Mixed strategy? **[6]**

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