

Total No. of Questions : 12]

SEAT No. :

P3296

[Total No. of Pages : 5

[4959]-5

**B.E. (Civil Engineering) (Semester - I)**

**SYSTEM APPROACH IN CIVIL ENGINEERING (Elective - I)**

**(2008 Course)**

*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) What is Optimization Technique? Explain various applications of Optimization Techniques in Civil Engineering. [8]
- b) Enlist various models used in System Approach. Explain any one in detail with suitable example. [8]

OR

- Q2)** a) What do you mean by System Approach? Explain different stages involved in System Approach. [8]
- b) What is Linear Programming? Define following terms related to Linear Programming. [8]
- i) Feasible Solution
  - ii) Basic Feasible Solution
  - iii) Optimum Basic Feasible Solution.
  - iv) Unbounded Solution

- Q3)** Cement to be supplied from four sources to four different construction project sites. The quantity of cement required for each site, the quantity available at each sources is given in the following table. [16]

***P.T.O.***

Source	Villages				Quantity
	A	B	C	D	Available
1	6	8	10	9	60
2	5	7	11	10	70
3	3	5	14	12	110
4	2	6	10	8	150
Quantity Required	80	90	100	120	390

Determine the transportation policy which will minimize the total cost of transportation. Solve by North West Corner Method & Least Cost Method.

OR

**Q4)** Write a short note on : **[16]**

- i) Assignment model
- ii) Transportation model
- iii) Advantages of Assignment Model and Transportation Model in Civil Engineering.

**Q5)** a) It is proposed to develop hydropower project on reservoir across 3 possible river sites. **[12]**

The total financial resources available are Rs. 400 Cr. The return function for each of the possible investment is given below. Find out maximum returns by Dynamic Programming.

Resources Allocated	Return from Sites		
	A	B	C
00	00	00	00
100	120	140	300
200	750	550	500
300	910	700	700
400	980	800	750

b) What is Multistage Decision Process? Explain with suitable example. **[6]**

OR

- Q6)** a) In an irrigation project, 6 million m<sup>3</sup> of water is to be supplied to 3 irrigation district. The net returns depending upon the quantity of water supplied are given below Using Dynamic Programming determine the allotment of water to each district so that the maximum return can receive. **[12]**

Qty.of water in million m <sup>3</sup>	Returns from Districts		
	1	2	3
0	1	2	3
1	0	0	0
2	5	6	4
3	9	11	9
4	14	15	13
5	17	19	18
6	21	22	20
7	25	26	23

- b) What is Dynamic Programming in Civil Engineering? Explain advantages and disadvantages of Dynamic Programming. **[6]**

### SECTION - II

- Q7)** a) What is Non-Linear Programming? Enlist methods of Non-Linear Programming. **[8]**
- b) With Fibonacci Method maximize  $f = 16x - 0.2x^2$  in the interval (0, 100) to an accuracy of 0.1% carry out 4 stages. **[10]**

OR

- Q8)** a) Explain minimizing procedure of Fibonacci Method. **[8]**
- b) Using Fibonacci method solve  
Minimize  $Z = x^3 - 108x$  in the range (0, 10) with an accuracy 0.1%. **[10]**

**Q9)** a) What is Sequencing Model? Explain with suitable example? Mention assumptions made in it. [8]

b) Five jobs are to be processed on 2 machines  $M_1$  and  $M_2$  in order  $M_1, M_2$ , processing time is in hours. Find the sequence of the total elapsed and idle time. [8]

Jobs	MachineA	Machine B
1	5	2
2	1	6
3	9	7
4	3	8
5	10	4

OR

**Q10)** A sample of 100 arrivals of 100 Dumpers at a construction Site is found to be according to following distribution. [16]

Time of arrival in (Min)	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
Frequency	2	6	10	24	20	15	10	7	4	2

A study of service time reveal time the following distribution.

Service Time (M)	0.5	1	1.5	2	2.5
Frequency	13	22	37	20	8

Estimate :

- The average waiting time of dumpers,
- The percentage waiting time for dumper
- Average idle time & Percentage idle time for 10 arrivals

Use the following random numbers

Arrival	16	77	23	02	77	28	06	24	25	93
Service Time	56	65	05	61	86	90	92	10	79	80

**Q11)** a) Explain the following methods : [8]

- Average cost method
- Annual equivalent annuity method
- Present value method
- MAPI method

b) For the Game given below, Determine the Optimal Strategies for A.[8]

Player A	Player B	
	I	II
I	4	2
II	3	8
III	2	12

OR

**Q12)** The estimate of maintenance cost, resale value for a machine A whose purchase price is Rs. 6000 over the years is given below. [16]

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs)	1000	1200	1400	1800	2300	2800	3400	4000
Resale Value (Rs)	3000	1500	750	375	200	200	200	200

A similar estimate for another machine B, which has 50% more capacity than a machine A and where purchase value is Rs 8000 is given below.

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs)	1200	1500	18000	2400	3100	4000	5000	6100
Resale Value (Rs)	4000	2000	1000	500	300	300	300	300

Find the replacement ages for machine A and Machine B as well as the corresponding minimum average annual costs.

