



Sanjay Ghodawat University, Kolhapur

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2018-19

EXM/P/09/01

Year and Program: 2018-19

School of Technology

Department of Civil Engg. (M. Tech)

Course Code: CEM 509.1

Course Title: Structural
Optimization

Semester – I

Day and Date

Wednesday - 26/12/2018

End Semester Examination
(ESE)

Time:

Max Marks: 100

10 am to 1 pm.

Instructions:

- 1) All questions are compulsory.
- 2) Assume suitable data wherever necessary.
- 3) Figures to the right indicate full marks.

Q.1	Solve the following questions.	Marks	Bloom's Level	CO
a)	Solve following problem by trial and error method Maximize $Z = 6X_1 + 8X_2$ Subject to $5X_1 + 10X_2 \leq 60$ $4X_1 + 4X_2 \leq 40$ Where $X_1, X_2 \geq 0$	10	L ₄	CO1
OR				
a)	Explain application of optimization in engineering field. Also state elements and assumption in optimization	10	L ₃	CO1
Q.2				
a)	Solve following Linear Programming Problem by Graphical Method Minimize $Z = 20X_1 + 10X_2$ Subject to $X_1 + 2X_2 \leq 40$ $3X_1 + X_2 \geq 30$ $4X_1 + 3X_2 \geq 60$ Where $X_1, X_2 \geq 0$	10	L ₄	CO2
OR				

- a) Solve following Linear Programming Problem by Graphical Method 10 L₄ CO3

$$\text{Maximize } Z = 100X_1 + 80X_2$$

$$\text{Subject to } 5X_1 + 10X_2 \leq 50$$

$$8X_1 + 2X_2 \geq 16$$

$$3X_1 - 2X_2 \geq 6$$

$$\text{Where } X_1, X_2 \geq 0$$

Q.3 Solve the following questions

- a) Consider the transportation problem below Find IBFS by 10 L₄ CO3

1) NW Corner Cell method

2) Least Cost Cell Method

						Supply
	3	4	6	8	9	20
	2	10	1	5	8	30
	7	11	20	40	3	15
	2	1	9	14	16	13
Demand	40	6	8	18	6	

OR

- a) Following table gives information about various activity 10 L₄ CO3

Activity	Normal Duration (Days)	Normal Cost (Rs)	Crash Duration (Days)	Crash Cost (Rs)
1-2	4	4000	2	12000
2-3	5	3000	2	7500
2-4	7	3600	5	6000
3-4	4	5000	2	10000

The indirect cost of project is Rs 2000 per day find optimum cost for given project

Q.4 Solve the following questions

- a) Solve following nonlinear programming using Lagrangean Method 10 L₄ CO4
 Maximize $Z = 2X_1^2 - 3X_2^2 + 18X_2$
 Subject to $2X_1 + X_2 = 8$
 Where $X_1, X_2 \geq 0$

OR.

- a) Solve Following nonlinear programming using Kuhn-tucker method. 10 L₄ CO4
 Maximize $Z = 8X_1 + 10X_2 - X_1^2 - X_2^2$
 Subject to $3X_1 + 2X_2 \leq 6$
 Where $X_1, X_2 \geq 0$

Q.5 Solve the following questions

- a) Explain decision tree with suitable example. 05 L₃ CO5

OR

- a) Define Simulation. List out advantages and disadvantages of simulation 05 L₃ CO5
 b) A dentist schedules all his patients for 30 min appointments. Some of 15 L₄ CO5
 the patients take more or less than 30 min depending upon type of dental work to be done.

Category of Work	Time Required (min)	Probability
Filling	45	0.40
Crown	60	0.15
Cleaning	15	0.15
Extraction	45	0.10
Check Up	15	0.20

Simulate the clinic for **four hour** and determine average waiting time for patients as well as idealness of doctor. Assume that all the patients show up at clinic at exactly their scheduled arrival time starting from **8 a.m.** . Random numbers :- 40,82,11,34,25,66,17,79

- c) Write short note on Dynamic Programming 10 L₃ CO5

Q.6 Solve the following questions

- a) Transit Mixers (used to transport concrete to placing locations) arrive at a batching plant from different sites in an area served by a common ready mix concrete plant. The intervals of the Transit Mixers are observed and yield the following results. 20 L₅ CO6

Arrival time interval (minutes)	2	3	4	5	6
Arrival time interval (minutes)	10	15	30	25	20

The time taken to load the Transit Mixers which are either 6 or 9 cum capacity are fairly constant at 3 and 5 minutes respectively, and both types are equally represented (equal probability) at the depot.

Start the trial from 10:00 AM and assume no Transit Mixer is waiting at this time. Random Number to be used for the computations are given below.

52,50,53 10,99,66

6,88,30,47,37,91

If batching plant loads each of transit mixer immediately arrives answer following questions corresponding to first 6 trials

- 1) What is the total time (in minutes) likely that the Batching Plant will be waiting?
 - 2) What is the total time (in minutes) likely that the Transit Mixers will be waiting?
- b) Find dimensions of rectangle beam having area 10 sqm whose perimeter is as small as possible 10 L₄ CO6
- OR**
- b) A 500 m compound wire is cut into two parts and used for two square plots .what is minimum possible sum of area two plots. 10 L₄ CO6
