

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular), April 2018
B. Tech (EE), Semester IV

Roll No.....

COURSE CODE: MA 404

Time: 3 hours

Max. Marks: 100

COURSE NAME: Engineering Optimization

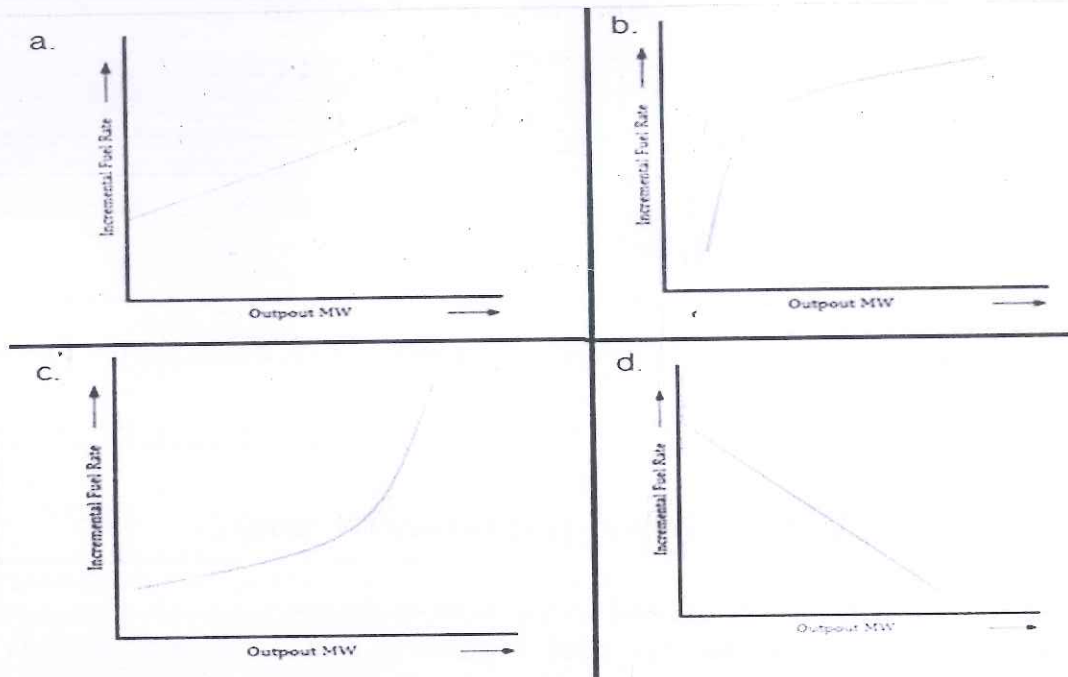
Instructions to students:

1. Do not write anything other than your roll number on question paper. Assume suitable data wherever required and mention it clearly.
 2. Be neat!! Be clean!! All the best!!!!
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Q.1A Objective type multiple choice questions (10 questions @ 1 mark)

10

- i. Motion Film is the example of
(a) iconic (b) symbolic (c) both (a) and (b) (d) None of theses
- ii. If the total supply is less than the total demand, a dummy source (row) is included in the cost matrix with.....
(a) dummy demand (b) zero cost (c) dummy supply (d) both A and B
- iii. 'No passing rule' is related with ;
(a) transportation models (b) assignment models (c) sequencing models (d) None of theses
- iv. The simplex multiplier is
(a) C_B (b) C_BB (c) C_BB^{-1} (d) None of theses
- v. Possion distribution is used to solve
(a) queueing models (b) sequencing models
(b) (c) both (a) and (b) (d) None of theses
- vi. Dual simplex method is used to solve
(a) project scheduling (b) linear problem
(c) network scheduling (d) None of theses
- vii. An activity (i,j) is said to be critical if
(a) $E_i=L_i$ (b) $E_j=L_j$ (c) both (a) and (b) (d) None of theses
- viii. Which among the following factors influence the cost of generation of electric power?
(a) Generator efficiency (b) Fuel cost (c) Transmission losses
(d) All of these (e) None of these
- ix. Which among the following curves represent the incremental fuel rate curve?



(a) Only a (b) Only b (c) Only c (d) Only d

x $P_{Gi}^{Min} \leq P_{Gi} \leq P_{Gi}^{Max}$ for

- (a) Real power balance constraints (b) Generation capacity constraints
(c) Both (a) and (b) (d) None

Q.2 Short answer type questions (4 questions @ 2.5 marks)

10

Q.2A In a thermal plant how the sequence of adding units is decided?

Q.2B Discuss the social benefits of power system optimization.

Q.2C Distinguish LPP, NLPP and DPP with the help of examples.

Q.2D Supporters arrive at an administrator counter at an average inter-arrival rate of 2 minutes. The administrator in duty takes an average of one minute per supporter. What is average waiting time of a Supporter?

Q.3A Write applications of LPP then solve the following LPP by Graphical method.

05

$$\text{Max. } Z = 6x_1 + 15x_2$$

$$\text{Subject to } 5x_1 + 3x_2 \leq 15$$

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

$$\text{and } x_1, x_2 \geq 0$$

Q.3B In a company, truck manger wants to assign four numbers of trucks A, B, C and D to city Agra, Delhi, Jaipur and Punjab. Solve the following assignment for the total minimum cost.

05

		City			
		Agra	Delhi	Jaipur	Punjab
No of Truck	A	10	12	19	11
	B	5	10	7	8
	C	12	14	13	11
	D	8	15	11	9

- Q.4A Derive (M/M/1): (FCFS/ ∞ / ∞) model. 05
- Q.4B Use dynamic programming to solve 05
- Min. $Z = u_1 u_2 \dots u_n$
s. to $u_1 + u_2 + \dots + u_n = c$
and $u_i \geq 0, i=1, 2, \dots, n$
- Q.5A Write the steps which are involving in simulations. Also, discuss the basic requirements of simulation. 05
- Q.5B Why it is necessary to operate hydro and steam plant in combination? Discuss. 05
- Q.6A ALMER MALAYSIA food company is developing a low-calorie high-protein diet supplement called Hi-pro. The specifications for Hi-pro have been established by a panel of medical experts. These specifications along with the calorie, protein and vitamin content of three basic foods, are given in the following table: 05

Nutritional Elements	Units Of Nutritional Elements			Basic Foods Hi-pro specifications
	1	2	3	
Calories	350	250	200	300
Proteins	250	300	150	200
Vitamin A	100	150	75	100
Vitamin C	75	125	150	100
Cost per serving (Rs.)	1.50	2.00	1.20	

What quantities of foods 1, 2, and 3 should be used? Formulate this problem as an LPP to minimize cost of serving.

- Q.7A How the unit commitment is differ than economic dispatch? Discuss the constraints shared by the unit commitment. 05
- Q.7B Solve the following LPP with dual simplex method: 10
- $Max Z = 5x_1 - 2x_2 + 3x_3$
Subject to $2x_1 + 2x_2 - x_3 \geq 2, 3x_1 - 4x_2 \leq 3, x_2 + 3x_3 \leq 5$
and $x_1, x_2, x_3 \geq 0$
- OR
- Q.7B State the Kuhn-Tucker conditions. Write down the Kuhn-Tucker conditions to get an optimal solution of the following Non-linear programming problem: 10
- $Maximize Z = -x_1^2 - x_2^2 - x_3^2 + 4x_1 + 6x_2$
Subject to: $x_1 + x_2 \leq 2, 2x_1 + 3x_2 \leq 12$
and $x_1, x_2 \geq 0$
- Q.8A The incremental cost of two units are 10
- $\frac{dF_1}{dP_1} = 0.25 P_1 + 50 \text{ Rs./MW-hour}$
 $\frac{dF_2}{dP_2} = 0.25 P_1 + 50 \text{ Rs./MW-hour}$
Where P_1 and P_2 are output in MW.
The system load varies as under:

12 Midnight to 6 am	60 MW
6 am to 9 pm	200 MW
9 pm to 12 midnight	60 MW

The capacity of each unit 150 MW.

- (a) Would be more economical to keep both units operating during the whole period of 24 hours or shut down one unit during low period. A cost of Rs. 200 is incurred in taking a unit off and returning it to service.
- (b) What is the economic loading during the high load period?
- (c) Find the total fuel cost during peak load period.

Q.9A A Shoe making company will start the new project for upcoming year. A project schedule activity involving has the following characteristics: 10

Activity	Description of Activity	Time (weeks)
1-2	Confirmation sample making	4
1-3	Sample approval	1
2-4	Leather procuring	1
3-4	Pattern for last making	1
3-5	Lace procuring	6
4-9	Insole procuring	5
5-6	Heel making	4
5-7	Production sample making	8
6-8	Upper making	1
7-8	Insole making	2
8-10	Lasting and Packing	5
9-10	Material Shipping	7

- (a) Construct the network.
- (b) Compute 'E' and 'L' for each event, and
- (c) Find the critical path.

Q.9B A dairy firm has three firms located throughout a state. Daily milk production at each plant is as follows: 10

Plant 1- 3 million liters; Plant 2- 12 million liters; Plant 3- 8 million liters;
Each day the firm must fulfil the needs of its four distribution centers. Minimum requirement at each center is as follows:

Distribution center 1- 7 million liters; Distribution center 2- 5 million liters;
Distribution center 3- 9 million liters; Distribution center 4- 2 million liters;

Cost of shipping one million liter of the milk from each plant to each distribution center is given in the following table in hundreds of rupees.

Plants	Distribution Centers				
		1	2	3	4
	1	2	3	11	7
	2	12	10	6	1
	3	5	8	15	9

The dairy firm wishes to decide as to how much should be the shipment from which plant to which distribution center so that the cost of shipment may be minimum. Also, find the solution using u-v method.

OR

- Q.9B Use graphical method to minimize the time needed to process the following jobs on the machines shown below. Also, calculate the total elapsed time needed to complete both the jobs. 10

Job 1	Sequence of machines time	A	B	C	D	E
		3	4	2	6	2
Job 2	Sequence of machines time	B	C	A	D	E
		5	4	3	2	6