Hall Ticket No: | | | | | | | | | | |

Code No: AMEB12

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER

B.Tech VI Semester End Examinations (Regular), May – 2020

Regulation: IARE-R18

OPTIMIZATION TECHNIQUES

(ME)

Time: 3 hours **Max. Marks: 70**

Answer ONE Question from each MODULE All Questions Carry Equal Marks

All parts of the question must be answered in one place only

MODULE – I

1. a) Define OR models and explain briefly about general methods for solving OR models. [7M]

   b) Solve the following problem by Simplex method [7M]

   Maximize Z = 5x1 + 3x2 subject to constraints

   $3x1 + 5x2 \leq 15$

   $5x1 + 2x2 \leq 10$

   and $x1, x2 \geq 0$

2. a) Formulate Linear Programming problem mathematically and discuss briefly the algorithm of simplex method to solve an Linear Programming. [7M]

   b) A firm manufactures two types of products A and B and sells them at a profit of Rs 2 on type A and Rs 3 on type B. Each product is processed on two machines G and H. Type A requires one minute of processing time on G and two minutes on H; type B requires one minute on G and one minute on H. The machine G is available for not more than 6 hour 40 minutes while machine H is available for 10 hours during any working day. Formulate the problem as a linear programming problem and find the optimum solution graphically. [7M]

MODULE – II

3. a) Explain Practical Steps Involved in Solving minimization type Transportation Problems. [7M]

   b) Solve the following assignment problem to minimize the total time of the operator; [7M]

	Jobs				
Operator	1	2	3	4	5
1	6	2	5	2	6
2	2	5	8	7	7
3	7	8	6	9	8
4	6	2	3	4	5
5	9	3	8	9	7
6	4	7	4	6	8

4. a) Define Assignment model. Explain briefly the steps involved in solving assignment model problem. [7M]

b) The company has three plants A, B and C and three warehouses X, Y and Z. Number of MODULEs available at plants is 60, 70 and 80 respectively. Demand at X, Y and Z are 50, 80 and 80 respectively. MODULE costs of transportation are as follows: [7M]

	X	Y	Z
A	8	7	3
B	3	8	9
C	11	3	5

What would be your optimal transportation plan? Give minimum distribution cost.

MODULE – III

5. a) Describe with examples the failure mechanism of items. [7M]

b) There are five jobs, each of which must go through the two machines A and B in the order BA. Processing times are given in below table. [7M]

	Processing times (hours)					
Job	1	2	3	4	5	6
Time for A	3	4	5	2	1	6
Time for B	8	7	6	9	10	9

Determine a sequence for five jobs that will minimize the elapsed time. Calculate the total idle time for the machines in this period.

6. a) Explain step by step procedure for processing 'n' jobs through three machines mentioning conditions. [7M]

b) A machine owner finds from his past records that the costs per year of maintaining a machine whose purchase price is Rs. 6000 are given below. [7M]

Year	1	2	3	4	5	6	7	8
Maintenance (Rs)	1000	1200	1400	1800	2300	2800	3400	4000
Resale price (Rs)	3000	1500	750	375	200	200	2000	200

Determine at what age a replacement is due?

MODULE –IV

7. a) What is Economic Order Quantity? Discuss step by step the development of Economic Order Quantity equation. [7M]

b) Solve the following 3 * 3 game. Find the value of the game and strategies of player A and B. [7M]

		Player B		
		1	**2**	**3**
Player A	1	2	4	5
	2	10	4	9
	3	4	5	6

8. a) Define pay of matrix and discuss types of strategies in game theory? [7M]

b) Monthly demand for an item is 200 MODULEs. Ordering cost is Rs 3350, inventory carrying charge is 24% of the purchase price per year. The purchase prices are P_1 = Rs 10 for purchasing Q_1 500 [7M]

P_2 = Rs 9.25 for purchasing 500 Q_2

P_3 = Rs 8.75 for purchasing 750 Q_3

Determine optimum purchase quantity. If the order cost is reduced to Rs 100 per order, compute the optimum purchase quantity.

MODULE – V

9. a) Explain briefly what factors must be considered when designing simulation experiment. [7M]

b) A super market has two girls ringing up sales at the counters. If the service time for each customer is exponential with mean 4 minutes, and if people arrive 3 in a poison fashion at the 10/hour. [7M]

a. What is the probability of having to wait for the service?
b. What is the expected percentage of idle time for each girl?
c. Find the average length and average number of MODULEs in the system?

10. a) What is Dynamic programming and explain the steps involved in the calculus method of solution. [7M]

b) A bakery keeps stock of a popular brand of cake. Previous experience show the daily demand pattern for the item with associated probabilities as given below: [7M]

Daily demand (numbers)	0	10	20	30	40	50
Probability	0.01	0.20	0.15	0.50	0.12	0.02

Use the following sequence of random numbers to simulate the demand for next 10days.

Random numbers: 25, 39, 65, 76, 12, 05, 73, 89, 19, 49

Also estimate the daily average demand for the cakes on the basis of the simulated data.

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

CLOURSE OBJECTIVES:

I	Formulate the mathematical model of real time problems and optimize with LLP techniques.
II	Establish the problem formulation and optimization by using transportation, assignment models.
III	Apply Sequencing and replacement models for optimized decisions
IV	Apply Game theory, Inventory models for effective operational control.
V	Visualize application of Waiting line, Dynamic programming, Simulation models in real time applications..

CLOURSE LEARNING OUTCLOMES:

CLO Code	CLO's	At the end of the course, the student will have the ability to:
AMEB12.01	CLO 1	Understand the characteristics, phases, types of operation research models and its applications.
AMEB12.02	CLO 2	Visualize modeling principles scope, decision making, general methods for solving OR models.
AMEB12.03	CLO 3	Understand linear programming concepts, problem formulation and graphical models.
AMEB12.04	CLO 4	Understand simplex method and artificial variable techniques.
AMEB12.05	CLO 5	Comprehend two-phase method and Big-M method of linear programming.
AMEB12.06	CLO 6	Apply to build and solve transportation models of balanced.
AMEB12.07	CLO 7	Understand the degeneracy model problem of transportation, unbalanced type-maximization.
AMEB12.08	CLO 8	Apply to build assignment models for optimal solution.
AMEB12.09	CLO 9	Understand variants of assignment model and travelling salesman model.
AMEB12.10	CLO 10	Understand the flow shop sequencing model of 'n' jobs through two machines and three machines.
AMEB12.11	CLO 11	Comprehend job shop sequencing of two jobs through 'm' machines.
AMEB12.12	CLO 12	Understand the concept of replacement of items that deteriorate with time when money value is not counted.
AMEB12.13	CLO 13	Understand the concept of replacement of items that deteriorate with time when money value is n counted.
AMEB12.14	CLO 14	Visualize the replacement of items that fail completely and group replacement.
AMEB12.15	CLO 15	Understand minimax (maximini) criterion, optimal strategy , solution of games with saddle point
AMEB12.16	CLO 16	Visualize dominance principle while solving game theory problem.
AMEB12.17	CLO 17	Apply to solve m * 2 , 2 *n model of games and graphical method.
AMEB12.18	CLO 18	Understand the concepts of deterministic inventory model and purchase inventory model with one price break and multiple price breaks.
AMEB12.19	CLO 19	Visualize stochastic inventory models – demand may be discrete variable or continuous variable.
AMEB12.20	CLO 20	Understand the concepts of waiting line model of single channel and multi server model.
AMEB12.21	CLO 21	Visualize dynamic programming concepts and models
AMEB12.22	CL0 22	Comprehend the simulation models, phases of simulation, application l of simulation
AMEB12.23	CLO 23	Visualize the application of simulation for inventory and queuing problems.

MAPPING OF SEMESTER END EXAMINATION TO COURSE LEARNING OUTCOMES

SEE QUESTION No		COURSE LEARNING OUTCOMES		BLOOM TAXONOMY LEVELS
1	a	AMEB12.02	Visualize modeling principles scope, decision making, general methods for solving OR models.	Understand
	b	AMEB12.04	Understand simplex method and artificial variable techniques.	Understand
2	a	AMEB12.04	Understand simplex method and artificial variable techniques.	Remember
	b	AMEB12.03	Understand linear programming concepts, problem formulation and graphical models.	Understand
3	a	AMEB12.06	Apply to build and solve transportation models of balanced.	Remember
	b	AMEB12.08	Apply to build assignment models for optimal solution.	Understand
4	a	AMEB12.08	Apply to build assignment models for optimal solution.	Remember
	b	AMEB12.07	Understand the degeneracy model problem of transportation, unbalanced type-maximization.	Remember
5	a	AMEB12.13	Understand the concept of replacement of items that deteriorate with time when money value is n counted.	remember
	b	AMEB12.10	Understand the flow shop sequencing model of ‘n’ jobs through two machines and three machines.	Understand
6	a	AMEB12.10	Understand the flow shop sequencing model of ‘n’ jobs through two machines and three machines.	Remember
	b	AMEB12.13	Understand the concept of replacement of items that deteriorate with time when money value is n counted.	Understand
7	a	AMEB12.18.	Understand the concepts of deterministic inventory model and purchase inventory model with one price break and multiple price breaks.	Remember
	b	AMEB12.15	Understand minmax (maximini) criterion, optimal strategy , solution of games with saddle point	Understand
8	a	AMEB12.15	Understand minmax (maximini) criterion, optimal strategy , solution of games with saddle point	Remember
	b	AMEB12.18	Understand the concepts of deterministic inventory model and purchase inventory model with one price break and multiple price breaks.	Understand
9	a	AMEB12.21	Comprehend the simulation models, phases of simulation, application l of simulation	Remember
	b	AMEB12.20	Understand the concepts of waiting line model of single channel and multi server model.	Understand
10	a	AMEB12.20	What is Dynamic programming and explain the steps involved in the calculus method of solution.	Remember
	b	AMEB12.22	Visualize the application of simulation for inventory and queuing problems.	Understand

Signature of Course Coordinator **HOD, ME**