ARYA College of Engineering (ACE)
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Department of Mechanical Engineering
IV Year VII Semester
7ME5-12: Operation Research

Note: Each Assignment of Maximum marks10.All question carries equal marks.

Assignment-I

Q1	Discuss the significance and scope of OR in modern managements.	CO-1	BLT-1
Q2	A manufacture has five lathes and three milling machines in his workshop and produces an assembly that consists of 2 units of part A and 3 units of part B.The processing time of each part on the two types of machines is given below. **Processing time in minutes on a** Part / Lathe / Milling Machine A / 10 / 18 B / 25 / 12 In order to maintain a uniform work-load on the two types of machines, the manufacturer has framed a policy that no type of machine should run more than 40 minutes per day longer than the other machine. Formulate the problem as L.P. problem if the objective is to produce the maximum number of assemblies in any 8-hour working day.	CO-1	BLT-1
Q3	Use Two-phase simplex method to Maximize $Z = 5x_1 - 4x_2 + 3x_3$, subjected to $2x_1 + x_2 - 6x_3 = 20$, $6x_1 + 5x_2 + 10x_3 \leq 76$, $8x_1 - 3x_2 + 6x_3 \leq 50$, $x_1, x_2, x_3 \geq 0$	CO-1	BLT-2
Q4	A company has a team of four salesmen and there are four districts where the company wants to starts its business. After taking into account the capabilities of salesmen and the nature of districts, the company estimates that the profit per day in rupees for each salesman in each district is as below. Find the assignment of salesmen to various districts which will yield maximum profit.	CO-1	BLT-1
Q5	Solve the following transportation problem where cell entries are unit costs.	CO-1	BLT-3

Table in Q2:

Part	Processing time in minutes on a	
	Lathe	Milling Machine
A	10	18
B	25	12

Table in Q4:

Salesman	District	1	2	3	4
	A	16	10	14	11
	B	14	11	15	15
	C	15	15	13	12
	D	13	12	14	15

*BLT: BLT shows the **Bloom's taxonomy** levels.

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Assignment -II

Q1	Write short note on the branch and bound method.	CO-2	BLT-1
Q2	A machine costs Rs.500.Opeation and maintenance costs are zero for the first year and increase by Rs. 100 every year. If money is worth 5% every year, determine the best age at which the machine should be replaced. The resale value of the machine is negligibly Small. What is the weighted average cost of owning and operating the machine?	CO-2	BLT-1
Q3	Consider the following I.P. problem Maximize $Z= 2x_1+ 20x_2 -10x_3$, Subjected to $2x_1+20x_2 +4x_3 \leq 15$, $6x_1 +20x_2+4x_3 =20$, $x_1 ,x_2 ,x_3, \geq 0$ and integer. Solve the problem as a continuous linear problem; then show that it is impossible to obtain feasible integer solution by using simple rounding. Solve the problem using any integer problem algorithm.	CO-2	BLT-2
Q4	Write short note on zero-one programming	CO-2	BLT-1
Q5	What is the objective of replacement analysis?	CO-2	BLT-3

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Assignment-III

Q1	What do you understand by zero-sum and non zero-sum games?	CO-3	BLT-1
Q2	On the average 96 patients per 24-hour day require the service of an emergency clinic. Also on the average, a patient requires 10 minutes of active attention. Assume that the facility can handle only one emergency at a time. Suppose that it costs the clinic Rs.100 per patient treated to obtain an average servicing time of 10 minutes, and that each minute of decrease in this average time would cost the clinic Rs.10 per patient treated. How much would have to be bud-geted by the clinic to decrease the average size of the queue from patients to patient?	CO-3	BLT-1
Q3	A and B play a game in which has three coins a 5p,a 10p and 20p.Each player selects a Coin without the knowledge of the other's choice. If the sum of the coins is an odd amount, A wins B's coin; if the sum is even wins A's coin. Find the best strategy for each player and the value of the game.	CO-3	BLT-2
Q4	Customers arrive at a bank counter manned by a single cashier according to Poisson distribution with mean arrival rate 6 customers/hour. The cashier attends the customers on first come, first served basis at an average rate of 10 customers/hour with the service time exponential distribution. Find (a) The probability of the number of arrivals (0 through 5) during (i) 15 – minute interval (ii) 30-minute interval. (b) The probability that the queuing system is idle. (c) The probability associated with the number of customer (0 through 5) in the queuing system. (d) The time a customer should expected to spend in the queue. (e) The time a customer spends before leaving the bank counter.	CO-3	BLT-1
Q5	Determine optimum and value of the game for the following pay-off matrix.	CO-3	BLT-3

		Y		
X		R	S	T
	P	200	- 10	- 100
	Q	100	110	130

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Assignment-IV

.Q1	Write the various steps in decision theory approach.	CO-4	BLT-1
Q2	Write short note on Deterministic Inventory Model.	CO-4	BLT-1
Q3	A manufacturing company purchases 9,000 parts of machine for its annual requirements, ordering one month use at a time. Each part costs Rs.20. The ordering cost per order is Rs.15 and the carrying charges are 15% of the average inventory per year. Suggest a more economical purchasing policy for the company. How much would it be possible for the company to save per year?	CO-4	BLT-2
Q4	An ice cream retailer buys ice cream at a cost of Rs. 5 per cup and sells it for RS. 8 per cup; any remaining unsold at the end of the day can be disposed at a salvage price of RS. 2 per cup. Past values have ranged between 15 and 18 cups per day; there is no reason to believe that sales volume will take on any other magnitude in future. Find the EMV if the sale history has the following probabilities : 	Market Size	15	16	17	18	 	Probability	0.10	0.20	0.40	0.30		CO-4	BLT-1
Q5	Find the optimal order quantity for a product for which the price breaks are as follows: 	Unit cost(Rs)	Quantity	 	1000	0<q<500	 	925	500 ≤ q ≤ 4000	 	875	4000 ≤ q	 Ordering cost is Rs35,000/-,demand is 2400, time period =360 days and cost of storage is 0.06% of the unit cost.	CO-4	BLT-3

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Assignment-V

Q1	Explain simulation language ARENA.	**CO-5**	**BLT-1**
Q2	Find the value of π experimentally by simulation.	**CO-5**	**BLT-1**
Q3	Explain Monte Carlo method of simulation with suitable example.	**CO-5**	**BLT-2**
Q4	What is the need of simulation? Also discuss the advantages and disadvantages of simulation.	**CO-5**	**BLT-1**
Q5	A company has compiled the following information regarding a component it wants to purchase : The average usages are 120 units per day with standard deviation of 50 units per day based on the plant operating for 250 days per year. The acquisition cost per order is Rs.20.Inventory holding cost is Rs. 1 per unit per year and the acquisition lead time is constant at 10 days. The company has determined the allowable stock-outs per year to be one. Using the information determine. (i) the economic order quantity (ii) the required safety stock and the reorder level.	**CO-5**	**BLT-3**

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Department of Mechanical Engineering
IV Year VII Semester
7EE6-60.2: Power Generation Sources (PGS)
Note: Each Assignment of Maximum marks10.All question carries equal marks.
ASSIGNMENT-I

Q1.	Discuss the ongoing global transition in energy sources, emphasizing the role of renewable energy. What are the potential future scenarios for the world's energy landscape?	BLT-2	CO-1
Q2.	Analyze the challenges faced by India in meeting its growing energy demands. Explore potential solutions, considering the economic, environmental, and social aspects of the country's energy sector.	BLT-1	CO-1
Q3.	Compare and contrast the environmental impacts of traditional fossil fuels and renewable energy sources. How do these impacts influence the choice of energy options for sustainable development?	BLT-1	CO-1
Q4.	Elaborate on the interconnected relationship between the environment, economy, and energy. How can a balance be struck to ensure sustainable development while meeting energy needs?	BLT-2	CO-1
Q5.	Examine the key components of effective energy planning for sustainable development. Discuss the role of government policies in promoting a transition to cleaner and more sustainable energy sources	BLT-3	CO-1

ASSIGNMENT-II

Q1.	Explain the concept of nuclear fission and how it is utilized in nuclear power plants. Highlight the key factors that influence the efficiency of nuclear power generation.	BLT-3	CO-2
Q2.	Given a specific scenario, apply the knowledge of a combined gas and steam power plant to illustrate how it integrates both gas and steam cycles for improved efficiency.	BLT-3	CO-2
Q3.	Analyze the efficiency of various power plants (thermal, gas, hydro, nuclear) in terms of energy conversion. Discuss the factors that affect their efficiency and compare their advantages and disadvantages	BLT-3	CO-2
Q4.	Apply the principles of energy conversion in thermal power plants to analyze the impact of using different types of fuel on the overall efficiency and environmental footprint of the plant.	BLT-2	CO-2
Q5.	Compare and contrast the environmental impacts of thermal power plants and hydroelectric plants. Analyze how these impacts influence the choice of energy sources for sustainable development.	BLT-3	CO-2

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ASSIGNMENT-III

Q1. Discuss the factors that influence variations in solar radiation at different locations on Earth. How does the tilt of the Earth's axis contribute to seasonal changes in solar energy availability?	BLT-2	CO-3
Q2. Apply the principles of solar desalination to design a solar-powered desalination system for a community facing water scarcity. Consider technical and environmental aspects in your proposal.	BLT-2	CO-3
Q3. Describe the working principles of a solar thermal system, including the role of collectors and heat transfer mechanisms. How does this understanding contribute to the efficient conversion of solar energy into heat?	BLT-4	CO-3
Q4. Explain the concept of solar passive space heating. Provide examples of architectural design strategies that can maximize passive solar heating in buildings.	BLT-4	CO-3
Q5. Explain the importance of accurate measurement of solar radiation in the design and optimization of solar energy systems. Provide examples of instruments used for this purpose.	BLT-4	CO-3

ASSIGNMENT-IV

Q1 What is Belt'z limit for wind turbine? Derive the maximum efficiency of wind turbine.	BLT-1	CO-4
Q2 What is safety and environmental aspects of wind turbine.	BLT-1	CO-4
Q3 Explain vertical axis wind turbine.	BLT-2	CO-4
Q4 Give the site selection consideration for the installation of wind turbine.	BLT-3	CO-4
Q5 A 10 meter diameter rotor is rotating at 15 revolutions per minute (rpm) and the wind speed is 3 m/calculate tip speed ratio of the rotor.	BLT-3	CO-4

ASSIGNMENT-V

Q1 Explain in detail the sources of biomass.	BLT-3	CO-5
Q2 Explain the following OTEC cycle in detail. (i) Open cycle (ii) Closed cycle (iii) Hybrid cycle	BLT-3	CO-5
Q3 Define the following: (i) Spring tide, neap tide and diurnal tide. (ii) Tidal movement and tidal current.	BLT-3	CO-5
Q4. What is the process of biodiesel production?	BLT-3	CO-5
Q5. Explain direct combustion and gasification process.	BLT-3	CO-5

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