KUMARAGURU
college of technology
character is life

B.E DEGREE EXAMINATIONS: NOV /DEC 2024

(Regulation 2018)

Sixth Semester

MECHANICAL ENGINEERING

U18MET6002: Operations Research

Poisson Table (Distribution) to be given

COURSE OUTCOMES

CO1: Apply linear programming model and assignment model to domain specific situations

CO2: Analyze the various methods under transportation model and apply the model for testing the closeness of their results to optimal results

CO3: Apply the concepts of PERT and CPM for decision making and optimally managing projects

CO4: Analyze the various replacement and sequencing models and apply them for arriving at optimal decisions

CO5: Analyze and apply appropriate inventory techniques in domain specific situations.

CO6: Analyze and apply appropriate queuing theories in domain specific situations

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	Where the dual Simplex method can be applied?	CO1	[K1]
2.	Mention the purpose of Iterative procedure in linear problem?	CO1	[K1]
3.	Mention the steps in converting unbalanced assignment problem to balanced assignment problem with suitable example.	CO2	[K1]
4.	State the purpose of travelling salesman problem?	CO2	[K2]
5.	State the role of Economic order quality (EOQ)?	CO3	[K2]
6.	List out the reasons for maintaining inventory?	CO6	[K2]
7.	List out the rules for network construction?	CO4	[K2]
8.	Differentiate between CPM and PERT?	CO5	[K1]
9.	List out the important Terminologies in Queuing system.	CO6	[K2]
10.	Define Poisson Arrival Process?	CO5	[K1]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	Solve the given problem by using Big-M method.	16	CO1	[K2]

Minimize $Z = 3X_1 - X_2$,

Subject to $2X_1 + X_2 \leq 2$,

$\qquad X_1 + 3X_2 \geq 3$,

$\qquad X_2 \leq 4$,

$\qquad X_1, X_2 \geq 0$

12.	Find the optimal solution to transportation problem whose cost matrix is given below.	16	CO2	[K2]

	W1	W2	W3	W4	W5	Available
F1	68	35	4	74	15	18
F2	57	88	91	3	8	17
F3	91	60	75	45	60	19
F4	52	53	24	7	82	13
F5	51	18	82	13	7	15
Required	16	18	20	14	14	

13.	The following table gives the activities of a project in days. Construct the project network and find the critical path. Also calculate the total float and free float for each activity.	16	CO3	[K2]

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Duration	4	1	1	1	6	5	4	8	1	2	5	7

14.	A machine operator has to perform three operations turning, threading and knurling on a number of different jobs. The time required to perform these operations for each job is given. Determine the order in which the jobs should be processed in order to minimize the total time required to turn out all the jobs. Also find the ideal times for three operations.	16	CO4	[K2]

Job	Time for turning in minutes	Time for threading in minutes	Time for knurling minutes
1	3	8	13
2	12	6	14
3	5	4	9
4	2	6	12
5	9	3	8
6	11	1	13

15. a) The demand for an item is 9000 units per annum and the cost of one procurement is Rs.100 and holding cost per unit is Rs.2.40 per year. The replacement is instantaneous, and no shortages are allowed.   8   CO5   [K2]

Calculate i) EOQ ii) Number of orders per year iii) optimal order time

iv) optimal inventory cost.

b) Arrivals at a telephone booth are considered to be Poisson at an average time of 8 min between our arrival and the next. The length of the phone call is distributed exponentially, with a mean of 4 min. Determine (a) Expected fraction of the day that the phone will be in use. (b) Expected number of units in the queue Expected waiting time in the queue. (c) Expected number of units in the system. (e) Expected waiting time in the system   8   CO6   [K2]

16. Solve the following assignment problem and find optimal cost.   16   CO2   [K2]

	I	II	III	IV
1	5	7	11	6
2	8	5	9	6
3	4	7	10	7
4	10	4	8	3

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