



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH (EE) (N + O)/SEM-8/EE-802D, M802F/2011

2011

**PROJECT MANAGEMENT AND
OPERATIONS RESEARCH**

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

(Graph sheet(s) will be provided by the institute on demand.)

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

$$10 \times 1 = 10$$

- i) A project feasibility study is conducted on the basis of secondary data only.
 - a) True
 - b) False.
- ii) In PERT, the activities timings are deterministic in nature.
 - a) True
 - b) False.
- iii) Financing options are not weighted during the project feasibility stage.
 - a) True
 - b) False.



- iv) Optimality condition in simplex method for an LPP (maximizing problem) is
- a) $z_j - c_j > 0$ b) $z_j - c_j < 0$
c) $z_j - c_j = 0$ d) none of these.
- v) Artificial variable is applicable in case of the constraints of
- a) greater or equal type b) less or equal type
c) only equality type d) none of these.
- vi) Duration of dummy activity is
- a) non-negative b) positive
c) zero d) none of these.
- vii) The method of optimality test for a transportation problem is
- a) Least cost method b) VAM
c) Row minima method d) None of these.
- viii) The break-even point is calculated with a view to get same idea about the down side risk.
- a) True b) False.
- ix) BFS of an LPP
- a) is linearly dependent b) is linearly independent
c) either (a) or (b) d) forms a basis.
- x) Economic indicators indicate the change in pattern of demand.
- a) True b) False.
- xi) The debt service coverage ratio checks the profitability of a project.
- a) True b) False.



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Distinguish between resource leveling and resource allocation. 5
3. Find the IBFS of the following Transportation Problem by Least cost method : 5

	D ₁	D ₂	D ₃	D ₄	availability
O ₁	5	6	3	7	25
O ₂	3	8	5	3	35
O ₃	4	9	1	2	40
O ₄	6	7	4	8	30
demand	20	45	25	30	

4. Why is a project feasibility study undertaken ? 5
5. Solve the Assignment Problem by Hungarian method : 5

	I	II	III	IV
A	3	5	2	4
B	2	-	5	3
C	4	7	1	2
S	7	3	6	7

6. Construct the dual of the following LPP and show that the dual of the dual is primal.

$$\text{Maximize } Z = 6x_1 + 4x_2 + 6x_3$$

$$\text{subject to } 4x_1 + 3x_2 \geq 5,$$

$$7x_2 - 3x_3 \leq -8,$$

$$x_1, x_2, x_3 \geq 0.$$

5



GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Solve the LPP by Simplex method. Is there any optimum solution ? If yes, find it. 7

$$\text{Max. } Z = 6 X_1 + 4 X_2$$

$$\text{Subject to } 2X_1 + 3 X_2 \leq 30$$

$$3X_1 + 2 X_2 \leq 24$$

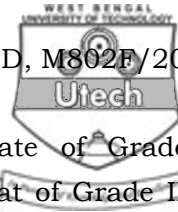
$$X_1 + X_2 \geq 3$$

$$X_1, X_2 \geq 0$$

- b) A branch of P. N. Bank has only one typist. Since the typing work varies in length (no. of pages to be typed), the typing rate is randomly distributed approximately Poisson distribution with mean service rate of 8 letters / hour. Letters arrive at the rate of 5/hour, during the 8 hours working day. If the typewriter is valued at Rs. 1.50/hour, determine (i) what is the busy time for the type writer, (ii) the percentage time that an arriving letter has to wait, (iii) Average system time and (iv) Average cost due to waiting on the part of typewriter.

8

8. a) A company has two grades of inspectors, I and II, who are to be assigned for a quality control inspection. It is required that at least 2000 pieces be inspected per 8 hour day. Grade I inspectors can check pieces at the rate of 50 per hour with an accuracy 97%. Grade II inspectors can check pieces at the rate of 40 per hour

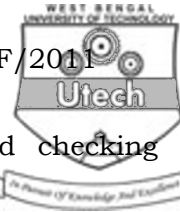


with an accuracy 95%. The wage rate of Grade I inspectors is Rs. 4.50 per hour and that of Grade II is Rs. 2.50 per hour. Each time an error is made by an inspector, the cost to the company is 1 rupee. The company has available, for the inspection job, 10 Grade I and 5 Grade II inspectors. Formulate the problem to minimize the total cost of inspection and solve it graphically. 7

- b) Solve the following Transportation Problem by VAM and also find the optimal solution. 8

	W_1	W_2	W_3	W_4	availability
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
demand	5	8	7	14	34

9. a) Discuss the Economic Order Quantity model (EOQ) where the demand rate is uniform, production rate is infinite and shortage are not allowed. 10
- b) A particular item has a demand of 9000 units/year. The cost of one procurements is Rs. 100.00 and the holding cost is Rs. 2.40/ year / unit. The replacement is instantaneous and no shortage are allowed. Determine
- Economics lot size (q^*)
 - No. of orders/year (n^*)
 - The time between orders (t^*)
 - The total cost / year if the cost of 1 unit is Rs. 1.00 (c^*). 5



10. a) Solve the transportation problem and checking the optimality, find the optimal solution. 9

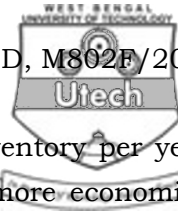
	D1	D2	D3	
O ₁	4	3	2	10
O ₂	1	5	0	13
O ₃	3	8	5	12
	8	5	4	

- b) Solve the following assignment problem :

		Jobs				
		1	2	3	4	5
Man	A	6	5	8	11	16
	B	1	13	16	1	10
	C	16	11	8	8	8
	D	9	14	12	10	16
	E	10	13	11	8	16

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11. a) A manufacturing company purchases 9000 parts of a machine for its annual requirements, ordering one month usage at time. Each part costs Rs. 20 The ordering cost per order is Rs. 15 and the carrying



charges are the 15% of the average inventory per year. You have been assigned to suggest a more economical purchasing policy for the company. What advice would you offer and how much would it save the company per year ? 7

- b) The rate of arrival of customers at a public telephone booth follows Poisson distribution with an average time of 10 minutes between one customer and the next. The duration of a phone call is assumed to follow exponential distribution, with mean time of 3 minutes.
- i) What is the probability that a person arriving at the booth will have to wait ?
 - ii) What is the average length of the non-empty queues that form from time to time ?
 - iii) Estimate the fraction of a day that the phone will be in use.
 - iv) What is the probability that it will take him more than 10 minutes altogether to wait for phone and complete his call ? 8

12. A client has approached you with a request for preparing a project feasibility report for setting up a cosmetic product factory near the capital of a country. How will you conduct your work and what type of data will you collect and analyze for submitting an honest and neutral report ? 15

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