405, 401, 403, 411, 417, 413, 303

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HARMATTAN SEMESTER EXAMINATION 2016/2017 SESSION

COURSE CODE/TITLE: ECO 413/OPERATIONS RESEARCH
INSTRUCTION: ANSWER QUESTION 1 AND ANY OTHER 2 QUESTIONS
TIME ALLOWED: 2 HOURS

1 (a) Write a short note on sensitivity analysis.

(b) From the view point of developing countries, what are those factors that limit Operations Research as a field of study?

(c) Use the graphical method to find the maximum value of

$$\text{Max } Z = x_1 + 2x_2$$

Subject to: $x_1 - x_2 \leq -1$
$-0.5x_1 + x_2 \leq 2$
$x_1, x_2 \geq 0$

(d) Use simplex method to solve the following problem

$$\text{Min } Z = 4y_1 + y_2$$

Subject to: $3y_1 + 4y_2 \geq 20$
$-y_1 - 5y_2 \leq -15$
$y_1, y_2 \geq 0$

2 (a) What is Simulation? Discuss the relevance of Simulation in decision making process

(b) A distributor stocks an item in which demand is uncertain. He wishes to evaluate a re-ordering policy of 150units at a re-order level of 150 to determine how economical the policy is over a 10-day period. The following information is available;

Possible demand	Probability	Cumulative Probability	Random number Allocation
40	0.10	0.10	00 – 09
50	0.15	0.25	10 – 24
60	0.25	0.5	25 – 49
70	0.30	0.8	50 – 79
80	0.20	1.0	80 – 99

Random Numbers	Forecast Demand
41	60
92	80
05	40
44	60
20	

Demand per day(units)	Probability
40	0.10
50	0.15
60	0.25
70	0.30
80	0.20

The carrying cost is #15 per unit, ordering cost is #50 per order, and loss of goodwill for each unit out of stock is #30. The lead time is 3days while the opening stock is 170 units. The probability distribution is to be based on the following random numbers: 41, 92, 05, 44, 66, 07, 00, 00, 14, and 62.

3 (a) Write short note on the following concepts:

i. Queue length
ii. System length
iii. Waiting time in the queue
iv. Server idle time

(b) Arrivals at a telephone booth are considered to be Poisson, with an average time of 20 minutes between one arrival and the next. The length of a phone call is assumed to be distributed exponentially, with mean of 6 minutes. Find

i. The probability that an arrival finds that four persons are waiting for their turn;
ii. The average number of persons waiting and making telephone calls.
iii. The average length of the queue that is formed from time to time.

4 (a) The critical path method (CPM) uses only one time estimate for each ac As against this, PERT uses, three time estimates where there is an eleme uncertainty in deciding upon the completion time of each activity and consequently the estimated project completion time. In view of this asser

i. Discuss the three time estimates with a view to overcome the uncertainty in the project time estimates

ii. State the two measures of variability of possible activity times with simplified formula.

(b) The supply in Kg from 4 sources, the demand in Kg from 4 destinations and the respective transportation costs in (#'00) of ABC product are as indicated in the table below. ABC PLC is interested in distributing the product. Advice the company on which of the 2 options, the Least Cost or North West Corner method it should adopt in its distribution so as to minimize the transportation cost.

SOURCE	DESTINATION				SUPPLY
	D1	D2	D3	D4	
S1	8	0	15	9	350
S2	0	5	7	15	350
S3	10	12	14	16	150
S4	7	5	9	16	200
DEMAND	150	250	350	300	