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Question Paper Code : 75490

5 Year M.Sc. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Fifth Semester

Software Engineering

ESE 051 – OPERATIONS RESEARCH

(Regulation 2010)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define the terms
 - (a) Basic solution.
 - (b) Basic feasible solution.

2. Write the dual of the linear programming problem.
Minimize $Z = 4X_1 - 5X_2 + 3X_3$
 $X_1 + X_2 - X_3 = 5$
Subject to constraint
 $2X_1 + 5X_2 - X_3 \geq -6$
 $3X_1 - 4X_2 + 4X_3 \leq -8$
 X_1 is unrestricted, $X_2, X_3 \geq 0$.

3. How will you balance the un-balanced transportation problems?

4. Write the mathematical model for assignment problems.

5. How will you estimate expected time for PERT?

6. What is critical path?

7. Give atleast four reasons for carrying inventories.

8. What is safety stock?

9. What do you understand by 'Balking' and 'Jockeying'?
10. Write at least three queue discipline.

PART B — (5 × 16 = 80 marks)

11. (a) Solve the given LPP by simplex method.

$$\text{Maximize } Z = X_1 - 3X_2 + 2X_3$$

Subject to condition

$$3X_1 - X_2 + 2X_3 \leq 7;$$

$$- 2X_1 + 4X_2 \leq 12;$$

$$- 4X_1 + 3X_2 + 8X_3 \leq 10$$

$$X_1, X_2 \text{ and } X_3 \geq 0.$$

(16)

Or

- (b) The evening shift resident doctors in a government hospital work for five consecutive days and have two consecutive days off. Their five days of work can start on any day of the week and the schedule keeps rotating. The hospital requires the following minimum number of doctors for each day.

Sun	Mon	Tue	Wed	Thu	Fri	Sat
35	55	60	50	60	50	45

No more than 40 doctors can start their five days on the same day. Formulate a LP model to minimize the number of doctors employed by the hospital. (16)

12. (a) (i) What is assignment problem? Give two areas of its application. (4)
- (ii) Find the initial basic feasible solution of the transportation problem by
- (1) north-west corner.
 - (2) vogel's approximation methods, where matrix cost is as given below. (12)

Origin	Destination				Supply
	A	B	C	D	
I	1	5	3	3	34
II	3	3	1	2	15
III	0	2	2	3	12
IV	2	7	2	4	19
Demand	21	25	17	17	

Or

- (b) A company has four distribution depots and four orders to be delivered to separate customers. Each depot has one lorry available, which is large enough to carry one of these orders. The distances between each depot and each customer are given below. How should the orders be assigned to the depots in order to minimize the total distance travelled?

Distance in kms per customer				
Depot	I	II	III	IV
A	68	72	75	83
B	56	60	58	63
C	38	40	35	45
D	47	42	40	45

13. (a) A project has the following times schedule.

Activity	Time in week	Activity	Time in week
(1-2)	4	5-7	8
(1-3)	1	6-8	1
(2-4)	1	7-8	2
(3-4)	1	8-9	1
(3-5)	6	8-10	8
(4-9)	5	9-10	7
(5-6)	4		

Construct CPM network and compute

- (i) T_E and T_L for each activity.
- (ii) Float for each activity.
- (iii) Critical path and its duration. (16)

Or

- (b) A project consists of a series of tasks labelled A, B, \dots, H , and I . The relationship ($W < X, Y$) means that X and Y cannot start until W is completed. With this notation, construct a network having constraints $A < D, E; B, D < F; C < G; B < H; F, G < I$. Also find the estimated time of completing the project when the time (in days) of completing each task is as given below.

Task :	A	B	C	D	E	F	G	H	I
Time :	23	8	20	16	24	18	19	4	10

14. (a) (i) Write the assumptions and derive the characteristics of inventory model with finite replenishment without shortage. (8)
- (ii) Given that the annual construction of material is 3600 units, ordering costs are 400 per order. Cost per unit of material is Rs.64 and storage cost or annual carrying cost is 50% of inventory value. Find out EOQ in units and rupees. (8)

Or

- (b) Shankar has to supply 10,000 bearings per day to an automobile manufacturer. He begins a production run every 10.5 days. The carrying cost is 2 paise per bearing per year and the set up cost is Rs.18. What should be his optimal production rate to meet the demand? Derive the formula used. (16)
15. (a) (i) Derive the model $(M/M/1): (\infty / FCFS)$ by stating the necessary assumptions and find the average number of customer in the system. (10)
- (ii) Describe Poisson process with its postulates. When a Poisson process is said to be homogeneous? (6)

Or

- (b) People arrive at a web browsing centre at the rate of 10/hr (Poisson arrival). There are two computers used for browsing and the expected time taken by a person is 10 minutes exponentially distributed Find :
- (i) The probability that both the computers are free when a person arrives. (4)
- (ii) The probability that the person can use a computer immediately on arrival. (4)
- (iii) The probability that there is no queue on arrival. (4)
- (iv) The expected number in the system. (4)