FACULTY OF ENGINEERING

B.E. IV/IV Year (Mech./Prod.) I Semester (Main) Examination, December 2010

OPERATIONS RESEARCH

Time : 3 Hours]

[Max. Marks : 75

Answer **all** *questions of Part A.*
Answer **five** *questions from Part B.*

Part A — (Marks : 25)

1. List the applications of Operations Research in Mechanical/Production Engineering.

    2.5

2. What is redundant constraint? Give an example.

    2.5

3. Distinguish between Primal and Dual problems.

    3

4. How do you select a key row and key column in Dual Simplex Method.

    2

5. Solve the following transportation problem by NWCR.

	Destination				Supply
Source	3	1	7	4	300
	2	6	5	9	400
	8	3	3	2	500
Demand	250	350	400	200	

    4

6. Why all assignment problem can't be solved as transportation, whereas vice – versa is possible.

    2

7. Explain briefly the failure mechanisms found in vogue.

    3

8. Define: saddle point, pay off matrix.

    2

9. List Assumptions of Thomsons Algorithm in sequencing.

    2

10. Mark the trade off between cost of providing service and cost of waiting time in queuing theory.

    2

[P.T.O.

Part B – (5 × 10 = 50)

11. Solve the following LP Graphically.   10

Max Z = $100x_1 + 50x_2$, STC: $4x_1 + 6x_2 \leq 24$; $x_1 \leq 4$; $x_2 \geq \frac{4}{3}$, $x_1, x_2 \geq 0$.

What is the special feature of this problem?

12. Solve the following LP by Simplex Routine.   10

Max. Z = $6x_1 + 8x_2$; STC: $5x_1 + 10x_2 \leq 60$; $4x_1 + 4x_2 \leq 40$; $x_1, x_2 \geq 0$.

Is it a non-degenerate case? If so why?

13. (a) Express transportation problem mathematically.   3

(b) A manufacturer must produce a product in sufficient quantity to meet contractual sales in next four months. The production capacity and unit cost of production vary from month to month. The product produced in one month may be held for sale in later months but at an estimated storage cost of Rs.1/ unit / month No storage cost is incurred for goods sold in the same month in which they are produced. There is no opening inventory and none is desired at the end of four months. Other details are as follows.

Month	Contracted Sales	Maximum Production	Unit cost of production
1	20	40	14
2	30	50	16
3	50	30	15
4	40	50	17

How much should the manufacturer produce to minimise total cost. Formulate the transportation problem.

Do Not Solve :

14. Solve the following assignment problem by Hungarian method   10

		Job				
		I	II	III	IV	V
	A	2	9	2	7	1
	B	6	8	7	6	1
Operators	C	4	6	5	3	1
	D	4	2	7	3	1
	E	5	3	9	5	1

15. (a) When does the replacement problem arise?   2

(b) Define time value of money. Given the rate of interest 8%. Calculate the present value after 6 years.   2

(c) An equipment was purchased at Rs.35,000 and the trade in value drops as time passes until it reaches a constant value of Rs.5000/- Determine the best period of replacement if the details are as follows (Amount in Rs).

Year of service	1	2	3	4	5
Year end trade-in value :	19,000	10,500	6,000	5,000	5,000
Annual operating Cost :	15,000	18,000	21,000	24,000	27,000
Annual maintenance : Cost	3,000	4,000	6,000	8,000	10,000

6

16. (a) State Thomsons Algorithm for 'n' Job on 2 Machines.   2

(b) Use graphical method to minimise the time elapsed in processing following jobs on the machines shown.

Job1 Time (hrs): 8   10   2   6   12   10
      Sequence: A   B   C   D   E   F

Job2 Time(hrs): 12 6   4   8   6   10
      Sequence: B   A   C   F   D   E   8

17. (a) Explain: Input process, queue discipline, service mechanism, Kendal's notation in queuing theory.   4

(b) In a bank cheques are cashed at a single 'teller' counter. Customer arrive at the counter in Poisson manner at an average rate of 30/hr. The Teller takes on an average a minute and a half to cash cheque. The service time has been shown to be exponentially distributed.

Calculate (i)   The percentage of time Teller is busy.
          (ii) The average time a customer is expected to wait.   6