The paper contains <u>THREE</u> pages and <u>ONE</u> part

I.ANSWER ANY SEVEN FULL QUESTIONS.   **(7x10=70)**

1. Formulate the problem. Explain each of the inequality.
   Bank One is in the process of devising a loan policy that involves a maximum of \$12 million. The following table provides the pertinent data about available loans.

Type of loan	Interest rate	Bad-debt ratio
Personal	.140	.10
Car	.130	.07
Home	.120	.03
Farm	.125	.05
Commercial	.100	.02

   Bad debts are unrecoverable and produce no interest revenue. Competition with other financial institutions dictates the allocation of at least 40% of the funds to farm and commercial loans. To assist the housing industry in the region, home loans must equal at least 50% of the personal, car, and home loans. The bank limits, the overall ratio of bad debts on all loans to at most 4%.   [10]

2. Solve by Simplex Method.
   Max $Z = x_1 + 4x_2 + 5x_3$
   subject to
   $3x_1 + 6x_2 + 3x_3 \leq 22$
   $x_1 + 2x_2 + 3x_3 \leq 14$
   $3x_1 + 2x_2+ \leq 14$
   and $x_1, x_2, x_3 \geq 0$ [10]

3. (a) Convert the Primal to dual.
       Min $Z = 3x_1 + 2x_2 + 12x_3 + 15x_4$
       subject to
       $4x_1 + 2x_2 + 6x_3 + 8x_4 \geq 3$
       $6x_1 + 8x_2 + 4x_3 + 2x_4 \geq 7$
       and $x_1, x_2, x_3, x_4 \geq 0$

   (b) Explain the Hungarian Method for assignment problem.   [5+5]

4. Solve the following transportation by North West Corner rule and Least Cost method.

	D1	D2	D3	D4	SUPPLY
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
DEMAND	5	8	7	14	34

[10]

5. Solve the sequencing problem giving an optimal solution when passing is not allowed.

		JOBS				
		A	B	C	D	E
MACHINES	M1	11	13	9	16	16
	M2	4	3	5	2	6
	M3	6	7	5	8	4
	M4	15	8	13	9	11

[10]

6. Machine A costs Rs 9000. Annual operating cost are Rs 200 for the 1st year, and then increase by Rs 2000 every year. Determine the best age at which to replace the machine. If the optimum replacement policy is followed, what will be the average yearly cost of owing and operating the machine ? (Assume that the machine has no resale value when replaced, and that future cost are not discounted). [10]

7. Define the following in the context of Game theory with a suitable example to support it.

   (a) Two person game
   (b) Zero-sum game
   (c) Pure strategy
   (d) Mixed Strategy
   (e) Saddle point [2+2+2+2+2]

8. (a) Write a short note on elements of a queuing model.

   (b) A publisher has a contract with an author to publish a textbook. The author submits a hard copy and a computer file of the manuscript. The (simplified) activities associated with the production of the textbook are summarized in the following table: Create the network model for the above data. [5+5]

Activity	Predecessor(s)	Duration (weeks)
A: Manuscript proofreading by editor	—	3
B: Sample pages preparation	—	2
C: Book cover design	—	4
D: Artwork preparation	—	3
E: Author's approval of edited manuscript and sample pages	A, B	2
F: Book formatting	E	4
G: Author's review of formatted pages	F	2
H: Author's review of artwork	D	1
I: Production of printing plates	G, H	2
J: Book production and binding	C, I	4

9. Figure provides the communication network between two stations, 1 and 7. The probability that a link in the network will operate without failure is shown on each arc. Messages are sent from station 1 to station 7, and the objective is to determine the route that maximizes the probability of a successful transmission. Formulate the situation as a shortest-route model, and determine the optimum solution.
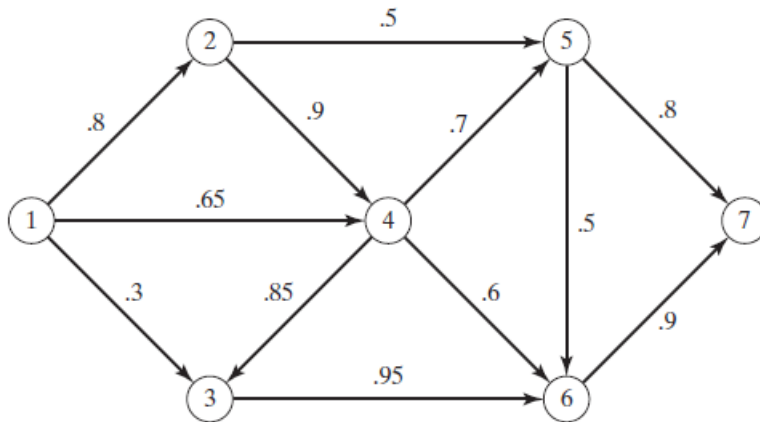
[10]

10. You are the owner of a small Swiss chemical firm that manufactures textile dyes. It's just after the conclusion of the Great War - World War I, although you don't yet know that another world war will follow - and business is not so good. You're trying to compete against giant German chemical firms and even though you have some accounts and the prospect of more, you know that it's going to be an uphill struggle. Suddenly, what could be an incredible opportunity has presented itself. All the German firms have passed on the opportunity to develop vitamins, recently discovered substances in food that have nutritional value - a deficiency in vitamin C, for instance, is the cause of scurvy and rickets is often the result of deficiency in vitamin D. Nonetheless, there is the nagging worry that the German giants are no fools and they must have had a good reason for passing on this one. Should you

   (a) take the information you have gained from the German firms and try to improve your business by hiring top-flight salesman?

   (b) take the plunge buy up the vitamin patents and concentrate on manufacturing and marketing them?

   (c) get your feet wet by manufacturing and test-marketing vitamins while simultaneously maintaining your chemical business?

   You need to come to a decision and provide the rational for it. [10]