Student Exam No._____

GANPAT UNIVERSITY

B. TECH. SEMESTER VIII (ELECTRICAL ENGINEERING)

REGULAR EXAMINATION APRIL – JUNE 2015

2EE832: OPTIMIZATION TECHNIQUES

Time: 3 Hours **Total Marks:** 70

Instruction:
1. All questions are compulsory.
2. Answers to two sections must be written in separate answer books.
3. Figures to the right indicate full marks.
4. Assume suitable data if necessary.

SECTION - I

Que-1

(A) Briefly trace the history of Operation Research. How did operations research develop after World War II? **[06]**

(B) A television repairmen finds that the time spent on his job has an exponential distribution with a mean of 30 minutes. If he repairs the sets in the order in which they came in, and if the arrival of sets follows a Poisson distribution with an approximate average rate of 10 per 8 hour- day, what is the repairman's expected idle time each day? . How many jobs are ahead of the average set just brought is the repairman's expected idle time each day? **[06]**

OR

Que-1

(A) Discuss the significance and scope of operations research in modern management. **[06]**

(B) A ware house has only one loading dock manned by three person crew. Trucks arrive at the loading dock at average rate of 4 per hour and the arrival rate is poisson distributed. The loading of truck takes 10 minutes on an average and can be assumed to be exponentially distributed. The operating cost of a truck is Rs 20 per hour and members of loading crew are paid Rs. 6 each per hour. Would you advise the truck driver to add another crew of three person? **[06]**

Que-2

Use the simplex method to solve the following LP Problem. **[11]**

Maximize $Z = 6X_1 + 5X_2$

1. $X_1 + X_2 \leq 5$
2. $3X_1 + 2X_2 \leq 12$
3. $X_1 , X_2 \geq 0$

OR

Que-2

(A) Use graphical method to solve following problem, Maximize $Z = 2X_1 + X_2$ **[06]**

1. $X_1 + 2X_2 \leq 10$
2. $X_1 + X_2 \leq 6$
3. $X_1 - X_2 \leq 2$
4. $X_1 - 2X_2 \leq 1$
5. $X1 , X2 \geq 0$

(B) XYZ Company has three department- Assembly, Painting and packing. The company can make three types of admirals, An almirah of type I requires one hour of assembly, 40 minutes of painting and 20 minutes of packing time, respectively. Similarly, an type II almirah needs 80 minutes, 20 minutes and one hour respectively. The almirah of type III requires 40 minutes each of assembly, painting and packing time. The total time available at assembly, painting and painting and packing department is 600 hours, 400 hours and 800 hours, respectively. Determine the number of each type of almirah that should be produced in order to maximize the profit. The unit profit for types I, II and III is Rs. 40, 80 and 60 respectively. **[05]**

Suppose that the manager of this XYZ company is thinking of renting the production capacities of the three departments to another almirah manufacturer – ABC company. ABC company is interested in minimizing the rental charges. On the other hand, the XYZ company would like to know worth of production hours to them, in each of departments, in order to determine the rental rates. (a) Formulate this as an LP Problem and solve it to determine the number of almirah that should be produced by XYZ company in order to maximize its profit (b) Formulate the dual of the primal LP problem and interpret your result.

Que-3

(A) An electronics company produces three types of parts for automatic washing machines .It purchases castings of the parts from a local foundry and then finishes the part on drilling, shaping and polishing machines. The selling prices of parts A, B, and C respectively are Rs 8, Rs.10 and Rs.14.All parts made can be sold. Castings for parts A, B and C respectively cost Rs.5, Rs.6 and Rs.10. The shop possesses only one of each type of machine. Cost per hour to run each of the three machines are Rs.20 for drilling, Rs.30 for shaping and Rs.30 for polishing. The capacities (parts per hour) for each part on each machine are shown in the following table. **[04]**

Machine	Capacities Per Hour		
	Part -A	Part –B	Part -C
Drilling	25	40	25
Shaping	25	20	20
Polishing	40	30	40

The management of the shop wants to know how many parts of each type it should produce per hour in order to maximize profit for an hour's run. Formulate this problem as an LP model so as to maximize total profit to the company.

(B) What do you understand by queue? Give any two example of queue system with situation, customers and service facility **[04]**

(C) What do you understand by (i) Queue discipline (ii) Service process? **[04]**

SECTION – II

Que-4

Solve the following all integer programming problem using branch and bound method, **[12]**
Maximize $Z = 3X_1 + 2.5X_2$ subject to the constraints

1. $X_1 + 2X_2 \geq 20$
2. $3X_1 + 2X_2 \geq 50$

$X_1, X_2 \geq 0$

OR

Que-4

(A) Sketch and explain the flow chart of Gomory's All integer programming algorithm **[06]**

(B) A manufacturer produces two types of models M1 and M2.Each model of the type M1 requires 4 hours of grinding and 2 hours of polishing; whereas each model of M2 requires 2 hours of grinding and 5 hours of polishing. The manufacturer has 2 grinders and 3 polishers. Each grinder works for 40 hours a week and each polisher works 60 hours a week. Profit on M1 model is Rs.3.00 and on model M2 is Rs.4.00.Whatever produced in a week is sold in the market. How should the manufacturer allocate his production capacity to the two types of models, so that he makes maximum profit in a Week? **[06]**

Que-5

(A) Write a procedural steps to find optimal transportation solution by MODI method. **[06]**

(B) Goods have to be transported from sources S_1, S_2, S_3 to destinations D_1, D_2, D_3. The transportation cost per unit, capacities of the sources, and the requirements of the destinations are given in following table. **[05]**

	D_1	D_2	D_3	Supply
S_1	8	5	6	120
S_2	15	10	12	80
S_3	3	9	10	80
Demand	150	80	50	280

Which cell generate degeneracy? Also determine transportation schedule so that cost is minimized

OR

Que-5

(A) A company has three production facilities A, B, C with production capacity of 14, 18 and 36 units per week of a product, respectively. These units are to be shipped to four warehouses D_1, D_2, D_3, D_4 with requirement of 10, 16, 14, 28 units per week respectively. The transportation cost in Rs. per unit between factories to warehouses are given in below table. Obtain optimal solution using MODI Method. **[08]**

	D_1	D_2	D_3	D_4
A	19	30	50	10
B	70	30	40	60
C	40	8	70	20

(B) A German car producer has factories in Frankfurt, Hamburg and Munich. It has distribution centers in Berlin, Cologne, Heidelberg and Stuttgart. The production capacities of the factories are 400, 600 and 1000 cars/month, respectively. The demand from the distribution centers are 800, 500, 300 and 400 cars/month, respectively. The unit costs of transport from the factories to the distribution centers are given by the following matrix: **[03]**

	Berlin	Cologne	Heidelberg	Stuttgart
Frankfurt	570	190	90	210
Hamburg	290	450	580	700
Munich	580	570	320	220

Find initial solution to this transportation system using North West Corner Method (NWCM).

Que-6

(A) Explain Hungarian method for solving Assignment Problem. **[06]**

(B) Five men are available to do five different jobs. From past records, the time (in hr) that each man takes to do each job is known and given in the following table. **[04]**

		Jobs				
		I	II	III	IV	V
Men	A	10	5	13	15	16
	B	3	9	18	13	6
	C	10	7	2	2	2
	D	7	11	9	7	12
	E	7	9	10	4	12

Find out how men should be assigned the jobs in way that will minimize the total time.

(C) Explain the difference between transportation problem and assignment problem. **[02]**

END OF PAPER