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Your Roll No.....

Sr. No. of Question Paper : 6524

J

Unique Paper Code : 2922071203

Name of the Paper : Quantitative Techniques

Name of the Course : **BBA (FIA)**

Semester : II

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. All Questions carry equal marks.
3. Attempt any five questions in all.
4. Use of Simple Calculator is allowed.

1. (a) Top Toys is planning a new radio and TV advertising campaign. A radio commercial costs Rs 300 and a TV ad costs Rs 2000. A total budget of Rs. 20,000 is allocated to the campaign. However, to ensure that each medium will have at least one radio commercial and one TV ad, the most that can be allocated to either medium cannot exceed 80% of the total budget. It is estimated that the first radio commercial will reach 5000 people, with each additional commercial reaching only 2000 new ones. For TV, the first ad will reach 4500 people, and each additional ad an additional 3000. How should the budgeted amount be allocated between radio and TV? Solve using Graphical Method. (10)

P.T.O.

(b) Obtain the dual for the following primal problem :

$$\text{Minimize } Z = 5x_1 + 6x_2 + x_3$$

$$\text{Subject to } x_1 + 2x_2 + x_3 = 15$$

$$-x_1 + 5x_2 \leq 18$$

$$4x_1 + 7x_2 \leq 20$$

$$x_1, x_2 \geq 0, x_3 \text{ unrestricted} \quad (8)$$

2. (a) Solve the following LPP using Two Phase method :

$$\text{Maximize } Z = 2x_1 + 2x_2 + 4x_3$$

$$\text{Subject to } 2x_1 + x_2 + x_3 \leq 2$$

$$3x_1 + 4x_2 + 2x_3 \geq 8$$

$$x_1, x_2, x_3 \geq 0 \quad (10)$$

(b) For the above LPP, answer the following questions :

(i) What are the shadow prices of the resources? Over what range in each of the RHS values are these shadow prices valid?

(ii) What are the ranges over which the objective function coefficients can vary for all the decision variables? (8)

3. (a) A milk producing co-operative union desires to determine how many kilograms of butter it should produce on daily basis to meet the demand. Past records have shown the following pattern of demand :

Quantity demanded (kg): 15 20 25 30 35 40 45

Days when given demand occurred: 4 16 20 80 40 30 10

Assume that the stock levels are restricted to the range 15-45 kg. (a multiple of 5 kg) and that butter left unsold at the end of the day must be disposed of due to inadequate storing facilities. Butter costs Rs. 14 per kg. and is sold at Rs. 20 per kg.

(i) Construct a payoff table,

(ii) Determine the optimal decision according to:

- expected profit
- maximax criterion
- minimax criterion

(10)

- (b) A company has four sales who are to be assigned to four different sales territories. The monthly sales increase estimated for each representative for different sales territories (in thousands of rupees) are given in following table :

SALES TERRITORIES

SALES REPRESENTATIVE	I	II	III	IV
A	180	130	150	200
B	140	100	130	120
C	170	175	170	180
D	160	155	140	170

(i) Obtain an optimal assignment and the total maximum increase in sales per month.

(ii) For certain reasons, if sales representative B cannot be assigned to sales territory III, will the optimal assignment schedule change? If so, what will be the new schedule and what will be the effect on the total sales?

(8)

4. (a) Given $x_{11} = 31$, $x_{12} = 25$, $x_{21} = 41$, $x_{23} = 41$ and $x_{32} = 77$ for the following transportation problem :

DISTRIBUTION CENTERS

FACTORY	W	X	Y	CAPACITY
A	4	8	8	56
B	16	24	16	82
C	8	16	24	77
DEMAND	72	102	41	

(i) Is it an optimal solution? If not, find the optimal solution.

(ii) Does the problem have multiple optimal solution? Give reasons. If so, find one more optimal solution.

(iii) If it is considered necessary to transport 20 units from factory A to distribution centre Y, what will be the impact on the cost with changed allocation. (10)

(b) Two packaged food manufacturers 'Knorr and McCain' are competing for increasing hit market shares. The pay-off matrix shown in the following table, describes the increase in market share to 'Knorr' and decrease in market share for 'McCain'. Determine the optimal strategies for both the firms and also the value of the game.

Knorr	McCain			
	(A)	(B)	(C)	(D)
Give coupons (A)	2	-2	4	1
Decrease price (B)	6	1	12	3
Maintain present strategy (C)	-3	2	0	6
Increase advertising (D)	2	-3	7	1

(8)

5. A small marketing project consists of the jobs in the table given below. With each job is listed its normal time and a minimum or crash time (in days). The cost (in Rs. per day) of crashing each job is also given :

Job (i-j)	Normal duration (days)	Minimum (crash) duration (days)	Cost of crashing (Rs. per day)
1-2	9	6	20
1-3	8	5	25
1-4	15	10	30
2-4	5	3	10
3-4	10	6	15
4-5	2	1	40

(i) Draw the network diagram for the project.

(ii) What is the normal project length and the minimum project length?

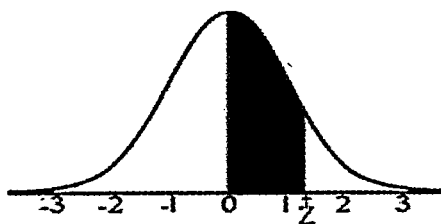
(iii) Overhead costs total Rs. 60 per day. What is the optimal length schedule duration on each job for optimal solution? (18)

6. A small project is composed of seven activities whose time estimates are listed in the table as follows :

Activity I-J	Estimated duration (weeks)		
	Optimistic	Most likely	Pessimistic
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

(i) Draw the project network and find the critical path.

- (ii) Calculate total float, free float and independent float.
- (iii) Find the expected duration and variance of each activity. What is the expected project length?
- (iv) Calculate the variance and standard deviation of project length. What is the probability that the project will be completed at least 4 weeks earlier than expected?
- (v) If the project due date is 19 weeks, what is the probability of meeting the due date? (18)



STANDARD NORMAL TABLE (Z)

Entries in the table give the area under the curve between the mean and z standard deviations above the mean. For example, for $z = 1.25$ the area under the curve between the mean (0) and z is 0.3944.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0190	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2969	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3513	0.3554	0.3577	0.3529	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998