SET B

Unique Paper Code	: 61011503
Name of the Paper	: Quantitative Techniques in Management
Name of the Course	: Bachelor of Management Studies (CBCS)
Semester	: V
Duration	: 3 hours
Maximum Marks	: 75

Instructions to Candidates:

(i)All Questions carry equal marks.

(ii) *The Question paper contains 6 Questions.*

(iii)Attempt any 4 Questions in all.

(iv) Use of Simple Calculator is allowed.

Q 1A manufacturer makes three models of storage bins: small, medium and large. Processing of these storage bins is done on three machines: M_1, M_2 and M_3. The small model requires 4 hours on M_1, 8 hours on M_2, and 6 hours on M_3. The medium model requires 6 hours on M_1, 6 hours on M_2, and 4 hours on M_3 while the model large requires 4 hours on M_1, 2 hours on M_2, and 8 hours on M_3. There are 240 machine hours per month available on M_1, 320 machine hours per month available on M_2, 200 machine hours per month available on M_3. The per unit profit gained from small model is Rs 80, from medium model is Rs 70 and from large model is Rs 60. Formulate the given problem as an LPP and solve it using the simplex method. What should be the monthly production of each type of storage bin in order to maximise profit? Determine the optimal amount of profit. Identify if there will be unused capacity on any machine? Also, formulate the dual of the above LPP.

Q 2There are two companies A and B in a certain city. Both firms have the same reputation and enjoy equal market share. Both companies want to attract greater number of customers by using innovative media strategies. Company A has constructed the following matrix of increase in sales(in ₹ Lakh) for various strategy combinations of the two companies:

	Strategies for B			
Strategies for A	**B_1**	**B_2**	**B_3**	**B_4**
A_1	3	-1	6	7
A_2	-1	8	15	12
A_3	16	13	14	10
A_4	1	11	2	1

Assuming a zero-sum game, determine the optimal strategy of the two companies and value of the game.

Q 3A market survey is made on three brands of breakfast foods X, Y and Z. Every time the customer purchases a new package, he may buy the same brand or switch to another brand. The following transition matrix for brand switching has been obtained:

		Next period brand		
		X	**Y**	**Z**
Present brand	**X**	0.80	0.15	0.05
	Y	0.12	0.75	0.13
	Z	0.10	0.12	0.78

At present it is estimated that 30 per cent of the people buy brand X, 20 per cent buy brand Y and 50 per cent buy brand Z. Find the market share of the three brands at the end of two periods. Compute the probability of a customer purchasing brand X at present buying brand Z at the end of period 3. Also, find the long-run market share of the three brands.

Q 4 Given below is the simplex table for a linear programming problem, use the information to answer the questions that follow:

	$C_j \rightarrow$	6	3	0	0	0	
C_j	Basic Variable	X_1	X_2	S_1	S_2	S_3	b_i
6	X_1	1	½	1/2	0	0	4
0	S_2	0	-1/2	-3/2	1	0	6
0	S_3	0	1	0	0	1	3

Is the given solution optimal? Give reason for your answer. State the optimal solution and the shadow price of the resources. Is there more than one optimal solution? If yes, find the alternate solution.

What is the range within which the objective function coefficient of the decision variable X_1 can vary? Also, determine the change in solution when the objective function coefficient for X_2changes to 5 in the given simplex table.

Q 5 A civil engineering firm has secured a contract to construct a dam. It has identified the following tasks which have to be completed for the completion of the project along with their respective duration:

Activity		A	B	C	D	E	F	G	H	I	J
Precedence		-	-	-	B	A	C	E, F	D, F	G, H	I
Duration	Shortest	3	8	4	2	1	7	5	6	8	9
(in months)	Longest	17	18	12	12	7	11	5	12	18	21
	Most likely	7	10	5	4	4	9	5	9	13	15

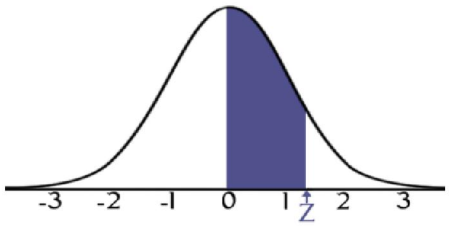
Draw the network diagram and determine the critical path.Estimate the expected duration and variance of the project.

Find the probability that the project will be completed after55 months. If the project manager wants to be 90% sure that the project should be completed in time, how many months prior to the deadline should he start it? Also calculate the chance of completing the project between 45 and 50 months?

Q 6 An event management company is booking four groups, each of which would give one singing performance in a particular city. Because of the local preferences of the people, the company is expecting that different groups will attract different audience size. Five major cities are under consideration of the company for organizing the singing performances. The estimate of sale of tickets is given as follows:

Group	City (*Estimated sale of tickets in ₹ '000*)				
	Pune	Bhopal	Kalimpong	Dehradun	Shimla
Symphony	58	56	21	50	45
Opus	16	34	18	25	15
Sonata	39	44	30	64	36
Concerto	82	102	71	110	73

Considering the sale of tickets that is likely to be made, what group – city combination would you suggest in order to maximise revenue? What will be the maximum revenue that can be earned? Which city will not host any singing performance? If for certain reason, the group Sonata cannot perform in Shimla, will the optimal assignment schedule change? Give reason for your answer.



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