University of Kelaniya – Sri Lanka

Centre for Distance and Continuing Education

Bachelor of Arts (General) Degree Third Examination (External) – 2013
2016 August – October
(New Syllabus)

Faculty of Social Sciences

Social Statistics - SOST- E3025

Operational Research

Answer any five (05) questions only

No. of questions : 08 **Time :** 03 **Hours**

01. (i) What is operational research? Describe its various Definitions?

(ii) Discuss the development of operational research. Your answer should specifically cover following time periods

(a) Pre – world war II

(b) World war II

(c) Post world war II

02. (i) Express the following linear programming problem in the standard form ;

Minimize $Z = X_1 + 2X_2 + X_3$

Subject to $X_1 + \frac{1}{2}X_2 + \frac{1}{2}X_3 \leq 1$

$\frac{3}{2}X_1 + 2X_2 + X_3 \geq 8$

$X_1 , X_2 \geq 0$

(ii) Solve the following problem by using graphical method.

Minimize $Z = 600\,X_1 + 400\,X_2$

Subject to

$1500\,X_1 + 1500\,X_2 \geq 20{,}000$
$3000\,X_1 + 1000\,X_2 \geq 40{,}000$
$2000\,X_1 + 5000\,X_2 \geq 44{,}000$

$X_1 , X_2 , X_3 \geq 0$

03. Find the optimal solution to the following problem using

(i) Simplex method

(ii) Duality

Minimize $Z = 3.0\ X_1 + 2.25\ X_2$

Subject to $2X_1 + 4\ X_2 \geq 40$

$3X_1 + 2\ X_2 \geq 50$

$X_1,\ X_2 \geq 0$

04. (i) Determine the initial solution to the following transportation problem (minimum) using;

(a) North – west corner rule

(b) Vogel's approximation method

	A	B	C	D	E	Supply
X	2	11	10	3	7	4
Y	1	4	7	2	1	8
Z	3	9	4	8	12	9
Demand	3	3	4	5	6	

(ii) Explain the followings using examples .

(a) The modified distribution method (MODI method).

(b) Maximising technique of transportation problem.

05. (i) Explain " The assignment model is a special case of transportation model ."

(ii) Consider the problem of assigning six operators to five machines. The assignment costs are given below.

machines	Operators 1	2	3	4	5	6
A	12	10	15	22	18	8
B	10	18	25	15	16	12
C	11	10	3	8	5	9
D	6	14	10	13	13	12
E	8	12	11	7	13	10

Assign the operators to different machines so that total cast is minimized.

06. A Small project is composed of 7 activities whose time estimates (weeks) are listed in the table below.

Activity	1-2	1-3	1-4	2-5	3-5	4-6	5-6
O	1	1	2	1	2	2	3
ML	1	4	2	1	5	5	6
P	7	7	8	1	14	8	15

O = optimistic estimate

ML= most likely time estimate

P = pessimistic time estimate

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

(ii) Find the variance of each activity.

(iii) What is the probability that the project will be completed at least three weeks earlier than expected?

07. (i) Explain the terms " process control" and " product control."

(ii) Distinguish the difference between control charts for " Variables " and control charts for " attributes."

(iii) Write a short note on "Acceptance sampling."

08. Explain the followings in connection with network.

(i) Maximum flow problem

(ii) Minimum spanning tree

(iii) Resource scheduling

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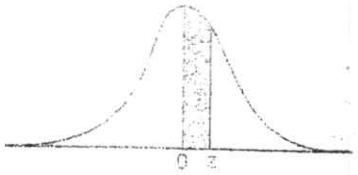
TABLE – 3

AREA OF A STANDARD NORMAL DISTRIBUTION

An entry in the table is the proportion under the entire curve which is between $z = 0$ and a positive value of z. Area for negative values of z are obtained by symmetry.



z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.8832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2703	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4415	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4841	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990