SLIATE

SRI LANKA INSTITUTE OF ADVANCED TECHNOLOGICAL EDUCATION

(Established in the Ministry of Higher Education, vide in Act No. 29 of 1995)

Higher National Diploma in Quantity Surveying
First Year, First Semester Examination – 2017
QS-11014 – Engineering Mathematics and Statics

Instructions for Candidates:
Answer Five (05) questions only.

No. of questions: 06
No. of pages : 05
Time : Three (03) hours

Q1.

(a) Find the characteristic equation of the following Matrix A. Also, prove that it verifies the Clay Hamilton Theorem.

$$A = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$$

(12 Marks)

(b) Find A^{-1} by using Clay Hamilton Theorem.

(08 Marks)

(Total 20 Marks)

Q2.

Test the convergence of the following series;

a) $\dfrac{1}{3} + \dfrac{1}{3} \cdot \dfrac{2}{5} + \dfrac{1}{3} \cdot \dfrac{2}{5} \cdot \dfrac{3}{7} +$ ... ...

(10 Marks)

b) $\dfrac{1}{4.7.10} + \dfrac{4}{7.10.13} + \dfrac{9}{10.13.16} +$ ... ...

(10 Marks)

(Total 20 Marks)

(a) If $x = u \; Cosv$ and $y = u \; Sin \; v$ prove that

$$\frac{\partial(x,y)}{\partial(u,v)} \; X \; \frac{\partial(u,v)}{\partial(x,y)} = 1$$

(10 marks)

(b) A pyramid is bounded by the three coordinate planes and the plane
$x + 2y + 3z = 6$. Compute the volume of a pyramid by using triple integration.

(10 Marks)

(Total 20 Marks)

Q4.

(a) The pass mark of an examination is 40. According to the previous examinations it is known that marks are normally distributed with mean value and standard deviation of 57 and 12 respectively. If 350 students face this examination how many students will pass the examination? (08 marks)

(b) A husband and wife appear in an interview for two vacancies for the same post. The probability of husband's selection is 1/7 and for that of wife's selection is 1/5. What is the probability that

    I.   Both of them will be selected?

    II.   Only one of them will be selected?

    III.   None of them will be selected?

(06Marks)

(c) Following are the marks obtained by two groups of students in various papers in an examination. Point out

    I.   Which is the better group?

    II.   Which is the more consistent group?

Group A Marks	15	19	24	36	44	45
Group B Marks	18	17	30	25	26	29

(06 marks)

(Total 20 Marks)

Q5.

(a) Find the Median value and standard deviation of the following frequency distribution.

Class	-	20-22	22-24	24-26	26-28	28-30
Frequency	-	03	06	12	09	02

(06 Marks)

(b) For the following set of data calculate

    I   Linear regression line

    II   Coefficient of correlation

X:	2,	4,	5,	6,	8,	11,	
Y:	18,	12,	10,	8,	7,	5,	(14 Marks)

(Total 20Marks)

Q6.

(a) Following data represent the total deposit (in million rupees) for one of the largest banks in Sri Lanka. Forecast the bank deposit for the month of December using

    I.   Moving average method of order four.

    II.   Single exponential smoothing method. Assume February month forecast is same as the deposit value of January and exponential smoothing factor, α is 0.1.

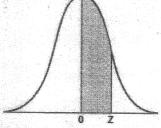| Month	Deposit (in million Rs.)
January	2310
February	2210
March	2690
April	3200
May	3100
June	2790
July	2400
August	2390
September	2480
October	2860
November	3470
December	

(10 Marks)

(b) Explain the role of the index number used in business and economy. (04 Marks)

(c) For the A, B and C commodities calculate the index numbers of the prices using the following methods.

   I.   Laspeyre's method.
   II.   Paashes method.
   III.   Fisher's Ideal method.

Commodities	1987		1988	
	Quantity	Price	Quantity	Price
A	10	12	11	10
B	8	9	7	7
C	7	6	8	7

(06 Marks)

(Total 20 Marks)

4

Table 1
(Area under standard normal curve from 0 to Z)

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	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.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	.2704	.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	.4515	.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	.4881	.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
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.6	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.9	.5000									