EASTERN UNIVERSITY, SRI LANKA
FACULTY OF COMMERCE AND MANAGEMENT
FIRST YEAR FIRST SEMESTER EXAMINATION IN BACHELOR OF BUSINESS ADMINISTRATION (HONOURS)/ BACHELOR OF COMMERCE (HONOURS) 2018/2019-[PROPER/REPEAT]
[MARCH 2022]
COM 1033 BUSINESS STATISTICS

ANSWER ALL QUESTIONS   **TIME: 03 HOURS**

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01. I) i) Distinguish the following terms:

    a) Population and Sample;

    b) Parameter and Statistic.

    ii) A researcher wants to estimate the overall average weekly occupancy rates of three-star hotels in Sri Lanka. A sample of 32 hotels from the 121 three-star hotels located in various parts of Sri Lanka was randomly selected to this study. Identify the relevant

    a) Population; b) Sample; c) Parameter; and d) Statistic to this study.

    (06 Marks)

II) There is a dispute between the management and the labour union regarding the efficiency and productivity of the employees of a manufacturing company. The management believes that it was taking the employees more than 20 minutes to complete a certain job task. A sample of 85 employees are selected and timed to complete the certain job task. The results are placed in the frequency table shown below.

Time to completion (in minutes)	Number of employees (Frequency)
5 - 6	2
7 - 8	8
9 - 10	10
11 - 12	15
13 - 14	17
15 - 16	14
17 - 18	7
19 - 20	9
21 - 23	3

a) Identify the relevant variable to this study.

b) Whether the variable identified in part (a) is (1) Qualitative or quantitative? (2) Discrete or continuous? Justify your answers.

c) What is the level of measurement of the variable identified in part (a)? Justify your answer.

d) Compute mean, median, and mode completion time of the certain job task. Interpret your answers.

e) Which of the measures computed in part (d) is probably a better measure to measure the efficiency and productivity of an employee in the manufacturing company?

f) Is management's belief about the completion time of the job task correct based on the selected sample? Justify your answer using the measures computed in part (d).

g) Management is also concerned that there is too much variations in the amount of time taken by the employees to complete the task. Identify and compute the statistic that would address management's concern.

(14 Marks)
(Total Marks 20)

02. I) i) Define the following terms:

a) Mutually exclusive events;   b) Independent events.

ii) A broker knows from the past experience that the probability that a client will buy stock is 65%. The probability that the client will buy a government bond if he or she already own stock is 35%.

a) What is the probability that a client owns both?

b) Are buying stock and buying bond are independent? Explain.

(06 Marks)

II) i) State the assumptions that are necessary for applying the following probability distributions:

a) Binomial distribution;   b) Poisson distribution.

ii) Ten percent of the computer disks produced by a new process are defective. If there are 10 disks in a box;

a) How many disks would you expect to be defective?

b) What is the probability that the number of defective disks equals the expected number you determined in part (a)?

c) What is the probability that at least 2 is defectives?

(08 Marks)

III) i) Distinguish the terms "normal distribution" and "standard normal distribution".

ii) The amount of soft drink bottles is normally distributed with a mean of 2.0 liters and a standard deviation of 0.05 liter. What proportion of the bottles will contain

   a) Between 1.90 and 2.0 liters?

   b) Below 1.90 liters or above 2.10 liters?

(06 Marks)
(Total Marks 20)

03. I) i) A stationery store wants to estimate the mean retail value of greeting cards that it has in its inventory. A random sample of 30 greeting cards indicates a mean value of Rs. 255 and a standard deviation of Rs. 44.

   a) Construct a 95% confidence interval estimate of the mean value of all greeting cards in the store's inventory. Interpret the interval.

   b) Suppose there were 2500 greeting cards in the store's inventory. Estimate the total value of the inventory using the interval constructed in part (a).

   c) What assumption do you need to make about the population distribution to construct the interval in part (a)?

ii) If a quality control manager wants to estimate the mean life of light bulbs to within ± 20 hours with 95% confidence and also assumes the population standard deviation is 100 hours, how many light bulbs need to be selected?

(10 Marks)

(II) i) State the six steps of hypothesis testing.

ii) A fast-food chain has developed a new process to ensure that orders at the drive-through are filled correctly. The previous process filled orders correctly 85% of the time. Based on a sample of 100 orders using a new process, 94 were filled correctly. At the 0.01 level of significance, can you conclude that the new process has increased the proportion of orders filled correctly?

(10 Marks)
(Total Marks 20)

04. I) Distinguish between

   a) Independent variable and dependent variable;

   b) Coefficient of correlation and coefficient of determination.

(04 Marks)

II) The management of Hope Airlines believes that there is direct relationship between advertising expenditures (X) and the number of passengers (Y) who choose to fly Hope Airlines. To determine whether this relationship does exist and, if so, what its exact nature might be, monthly values for advertising expenditures and number of passengers were collected for the 15 most recent months.

The data are shown in the table below.

Observation (Month)	Advertising cost (in Rs.1000's) (X)	Number of Passengers (in 1000's) (Y)
1	10	15
2	12	17
3	8	13
4	17	23
5	10	16
6	15	21
7	10	14
8	14	20
9	19	24
10	10	17
11	11	16
12	13	18
13	16	23
14	10	15
15	12	16

a) Construct a scatter diagram for the data.

b) Comment on the relationship between advertising cost and number of passengers using the scatter diagram.

c) Compute the least squares linear regression line of Y on X. Sketch this line on the scatter diagram constructed in part (a).

d) What does this line tell you about the relationship between advertising cost and number of passengers?

e) How much of variations in number of passengers is explained by advertising expenditures?

f) If the adverting expenditure is Rs.9000, how many passengers would choose Hope Airlines to fly?

(16 Marks)
(Total Marks 20)

05. I) The revenue (in thousands) of a private company in Sri Lanka by quarter since 2018 is given in the following table:

Year	Quarter			
	Q1	Q2	Q3	Q4
2018	203	187	71	231
2019	217	206	84	241
2020	237	225	92	270
2021	262	247	113	300

a) Calculate the four quarterly seasonal indexes using ratio-to-moving-average method.

b) The trend equation for the revenue of the company is given as $Y = 162.5 + 4.306t$. Forecast the 2022-Quarter Two (Q2) revenue.

c) What is the deseasonalized revenue for 2021-Quarter Three (Q3)?

(12 Marks)

II) A factory produces 50 cylinders per hour. Samples of 5 cylinders are taken at random from the production at every hour and the diameters of cylinders are measured. You are required to draw an R chart from the data and interpret about the process quality.

(For n=5, A2= 0.58; D3= 0; D4=2.11)

Sample No	X1	X2	X3	X4	X5	Average	Range
1	271	263	231	267	259	258.2	40
2	258	230	229	270	223	242	47
3	264	241	234	252	225	243.2	39
4	262	257	267	254	246	257.2	21
5	246	259	262	243	258	253.6	19
6	268	249	242	238	257	250.8	30
7	257	240	238	248	262	249	24
8	220	238	232	245	265	240	45
9	218	222	220	233	247	228	29
10	231	233	260	268	270	252.4	39

(08 Marks)
(Total Marks 20)

Student t-Distribution
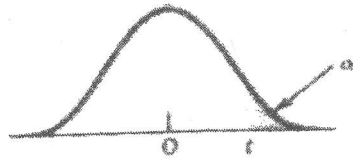
df \ α	.10	.05	.025	.01	.005
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
40	1.303	1.684	2.021	2.423	2.704
60	1.296	1.671	2.000	2.390	2.660
120	1.289	1.658	1.980	2.358	2.617
∞	1.282	1.645	1.960	2.326	2.576

Area Under Standard Normal Curve
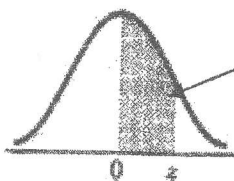
P(0 < Z <z)

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	.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	.2612	.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	.3820
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