88

RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. in Information Technology
First Year - Semester I Examination – May 2022

ICT 1404 – Mathematics and Statistics for Computing

Time: Three (03) hours

Instructions

- Answer **ANY FIVE (05)** questions.
- Calculators are allowed.
- Each question carries equal marks.
- Statistical tables and formulae are provided as attachments.

1. a) How many different words can be made using four letters of the word 'STATISTICS'?

(08 Marks)

b) A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has
(i) no girls
(ii) three girls
(iii) at least three girls

(12 Marks)

2. a) If $A = \begin{pmatrix} 1 & 2 \\ 5 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & -2 \\ 3 & 5 \end{pmatrix}$.
Find (i) A+B (ii) AB (iii) A^{-1} **(06 Marks)**

b) Using matrices or Cramer's rule solve the following linear equations.
x+3y+z=5, 3x+4y+3z=5, 9x+y+7z= -3

(14 Marks)

3. a) A basket contains 4 red, 5 blue and 3 green marbles. If 2 marbles are drawn at random from the basket, what is the probability that both are red?

(08 Marks)

b) A student travels to college by three routes A, B and C. The probabilities he choose those routes are respectively 0.6, 0.3 and 0.1. The probabilities that he is late for college if he go via route A, B and C respectively are 0.02, 0.04 and 0.05. Find the probability he is late for the college.

(12 Marks)

4. a) At a fuel filling station, 80% of customers pay by credit cards. Find the probability that in a randomly selected sample of five customers,
   a) Exactly two customers pay by credit cards,
   b) More than two customers pay by credit cards. **(10 Marks)**

   b) On average a machine breaks down four times during a month. Assuming that the number of breaks down can be modeled by a Poisson distribution, find the probability that it breaks down
   a) Exactly once in a given month,
   b) At most two times a given month,. **(10 Marks)**

5. The weight of a sugar packet which is normally distributed with a mean 400g and standard deviation 10g. Find the probability that the weight of a randomly selected sugar packet is
   a) more than 410g
   b) less than 390g.
   c) between 380g and 420g
   d) between 395g and 400g

   (20 Marks)

6. The information of age and value of a car are given by the following table.

Age, x (years)	Value, Rs. y (million)
2.0	6.1
2.5	5.5
3.0	5.0
3.5	4.6
4.5	3.8
5.0	3.5
6.0	3.3
7.0	1.0

   a) Calculate the equation of line of regression of y on x using least square method. **(10 Marks)**
   b) Estimate the value of the car when the age is 4 years. **(04 Marks)**
   c) Compute the coefficient of Determination. **(06 Marks)**

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Statistical Formulae

Probability Distributions

Normal distribution $Z = \frac{X - \mu}{\sigma}$, here μ = mean and σ = standard deviation

Binonmial distribution $P(x) = {}^{n}C_{x}p^{x}q^{n-x}$; here, q=1-p , x=0,1,2,...n

Poisson distribution $P(x) = \frac{e^{-\lambda}\lambda^{x}}{x!}$; here λ = mean=variance

Exponential distribution $P(x < T) = 1 - e^{-\frac{T}{\beta}}$ or $P(x \geq T) = e^{-\frac{T}{\beta}}$ here β = mean

"no-memory property". P(x> a + b | x>a)=P(x>b)

Uniform distribution

$$P(x) = \frac{1}{b-a} \quad for \quad a < x < b$$
$$= 0 \quad elsewhere$$

Correlation and Regression Analysis

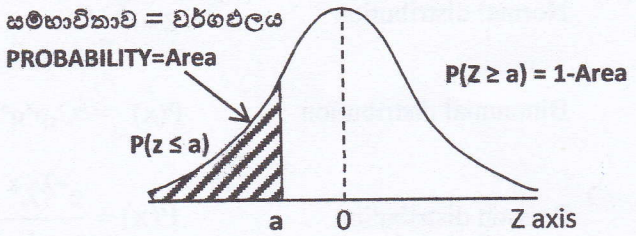
Karl Pearson's coefficient of correlaton, $r = \frac{n\sum xy - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$

Line of regression, $y=a+bx$ where $b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$ $a = \bar{y} - b\bar{x}$

Coefficient of Determination, R $R^2 = b^2\left(\frac{\sum x^2 - n\bar{x}^2}{\sum y^2 - n\bar{y}^2}\right)$ or $R^2 = b^2\left(\frac{n\sum x^2 - (\Sigma x)^2}{n\sum y^2 - (\sum y)^2}\right)$

$R^2=r^2$

සෘණ Z අගයයන් සඳහා සම්මත ප්‍රමත වගුව
Standard Normal Table for negative Z values



වගු අගය = වර්ගඵලය
Table value =Area

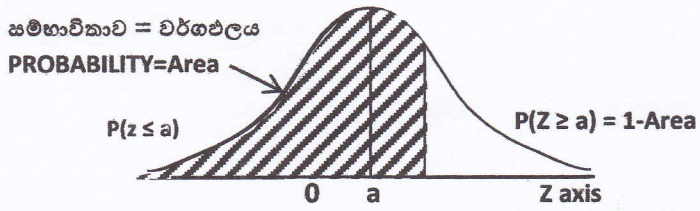
TABLE A

Standard normal probabilities

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
−3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
−3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
−3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
−3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
−3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
−2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
−2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
−2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
−2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
−2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
−2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
−2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
−2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
−2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
−2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
−1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
−1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
−1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
−1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
−1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
−1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
−1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
−1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
−1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
−1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
−0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
−0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
−0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
−0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
−0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
−0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
−0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
−0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
−0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641

ධන Z අගයයන් සඳහා සම්මත ප්‍රමත වගුව

Standard Normal Table for positive Z values



වගු අගය = වර්ගඵලය

Table value =Area

TABLE B

Standard normal probabilities (continued)

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998