NATIONAL SCHOOL OF BUSINESS MANAGEMENT
BSc in Management Information Systems (Special) (NSBM)–20.2/ 20.3
BSc (Honours) in Software Engineering (NSBM)– 20.2/ 20.3
BSc (Honours) in Computer Networks (NSBM)– 20.2/ 20.3
BSc (Honours) in Computer Science (NSBM)– 20.2/ 20.3

Year 02 Semester 01 Examination
13 June 2022
MA 201.3 - Statistics for Computing

Instructions to Candidates

1) **Answer All Questions.**

2) The duration of the question paper is 5 hours. Including half an hour to download the paper and upload your answers in a single file. (Note: **No email submissions are accepted under any condition.)**

3) Weightage of Examination: 60% out of final grade

4) Download the paper, provide answers to the selected questions in a word document.

5) Please upload the document with answers (Answer Script) to the submission link before the submission link expires

6) Answer script should be uploaded in PDF Format

7) Under any circumstances E-mail submissions would not be taken into consideration for marking. Incomplete attempt would be counted as a MISSED ATTEMPT.

8) The Naming convention of the answer script – Module Code_Subject name_Index No

9) You must adhere to the online examination guidelines when submitting the answer script to N-Learn.

10) Your answers will be subjected to Turnitin similarity check, hence, direct copying and pasting from internet sources, friend's answers etc. will be penalized.

Question 01

1. In a dance competition the panel of 10 judges sit on the same side of the long table. There are three female judges.
    a. How many different arrangements are there for seating the ten judges?
        [01 marks]
    b. How many different arrangements are there if all the 3 female judges decide to sit together? [02 marks]
    c. Find the number of different arrangements where the 3 female judges will not sit together? [02 marks]
    d. Four of the judges are selected randomly to judge the final round of the competition. Find the number of different ways where the panel consists of 2 male and 2 female judges. [03 marks]

2. In a series of surveys conducted on primary schools, it is noticed that the newly opened PQR school, where the performance of Grade 3 students in term tests is better than other schools.
    Discuss how the "probability" concept can be useful in determining the performance of next year grade 3 students of PQR school. [02 marks]

3. Briefly explain the basic requirements for assigning probabilities. (Basic properties of a probability distribution) [02 marks]

4. A die is rolled, and a coin is tossed, find the probability that the die shows an even number, and the coin shows a tail. (Support your answer with a diagram) [04 marks]

5. A jar contains 5 green pencils & 7 yellow pencils. Two pencils are chosen at random from the box with replacement.
    a. What is the probability that they are both yellow? [02 marks]
    b. What is the probability that they are same in color? [03 marks]

6. A box contains 5 red and 2 blue balls. A ball is drawn at random, and it is not replaced. Then a second ball is drawn at random.
    a. Using a tree diagram show all the possible outcomes? [2 Marks]
    b. Find the probability of getting at least one blue ball. [1 Mark]
    c. Find the probability of getting two of same colour. [1 Mark]

[Total = 25 marks]

Question 02

1) Birds of a particular species lay either 0, 1, 2 or 3 eggs in their nests with probabilities as shown in the table.

Number of eggs	0	1	2	3
Probability	0.25	0.35	0.30	K

    a. Find the value of k. [01 mark]

    b. What's the expected number of eggs laid in the nest? [02 marks]

    c. Find the standard deviation of number of eggs laid in the nest? [03 marks]

2) The mean number of defective batteries in packs of 20 is 1.6. Use a binomial distribution to calculate the probability that a randomly chosen pack of 20 will have more than 2 defectives batteries. [04 marks]

3) An airline regularly sells more seats for its early morning flight from London to Paris than are available. On average 5% of the customers who have purchased tickets do not turn up. For this flight, the airline always sells 108 tickets. Let X present the number of customers who do not turn up for this flight.

    a. State the distribution of X, giving one assumption you must make for it to appropriate. [03 marks]

There is room for 104 passengers on the flight. Using Poisson approximation, find the probability that,

    b. There are exactly three empty seats. [02 marks]

    c. Flight is full. [02 marks]

4) In a reading test for the eight-year-old children of Robert school, it is found that the reading score X is normally distributed with mean 5.0 and standard deviation 2.0.

    a. What proportion of children would you expect to score between 4.5 and 6.0? [02 marks]

    b. There are about 400 eight-year-olds in the school. How many would you expect to have a reading score of more than twice the mean? [04 marks]

    c. Find the probability that the randomly chosen eight-year-old gets a score less than 7.0 [02 marks]

[Total = 25 marks]

Question 03

1) Kris was given the responsibility of coaching 2 teams: a football team and a basketball team. He wants to use statistical techniques to understand and improve the performance of both the team players and following data representing weights in pounds of randomly selected 10 football players, and 10 basketball players was collected.

Football players	Basketball players
245	205
262	200
255	220
251	210
244	191
276	215
240	221
265	216
257	228
252	207

    a. Briefly explain the coach the importance of Correlation concept in analysing data. [02 marks]

    b. State the underlying assumptions of Correlation. [02 marks]

    c. Describe how the scatter plot can be used to understand the relationships among variables. *(Support your answer with diagrams.)* [05 marks]

    d. Comment about the relationship exists between weights of football players and basketball players. *(Hint: - use correlation coefficient)* [04 marks]

2) The following data give the hardness (x) and tensile strength (y) of 7 samples of metal in certain units.

X	146	152	158	164	170	176	182
y	75	78	77	79	82	85	86

    a. Find the intercept and slope of the linear regression equation. [04 marks]

    b. Interpret the above values. [03 marks]

    c. Find the tensile strength when it is found that there was no hardness owing to a problem arose in the production machine. [02 marks]

    d. Find the hardness level to the nearest whole number, for the tensile strength to be 91.43. [03 marks]

[Total = 25 marks]

Question 04

1. A magazine conducted a survey about the sleeping time of adults. A random sample of 12 adults were chosen from the adults travelling to work on a train.
    a. Give reason why this is an unsatisfactory sample for the purpose of the study.

    [02 marks]
    b. State a population for which this sample would be satisfactory.   [02 marks]

2. Briefly explain the Type I error in hypothesis testing.   [03 marks]

3. A machine is designed to make paperclips with mean mass 4.00g and standard deviation 0.08. The distribution of the masses of the paperclips is normal. A quality controller weighs a random sample of 25 paperclips and find their total mass to be 101.2g.
    a. Describe the use of hypothesis testing in real world.   [02 marks]
    b. Conduct a hypothesis test at 5% significance level to test whether this provides evidence of an increase in the mean mass of the paperclips.   [06 marks]

4. An ecologist sets up an experiment to test whether the climate is getting hotter. She collects random 20 days over the years and records the mid-day temperature. Her results are as follows.
    (Over a long period, it is proven that the average mid-day temperature is 23.9 ^{0}C)

    $\bar{x} = 24.565 \quad s = 4.42$

    a. State the null and alternative hypothesis she should use.   [02 marks]
    b. Carry out the test at 5% significance level.   [04 marks]
    c. Would your conclusion have been the same at the 10% significant level?

   [04 marks]

[Total = 25 marks]

-----End of the Paper-----

Numbers in each row of the table are values on a *t*-distribution with
(*df*) degrees of freedom for selected right-tail (greater-than) probabilities (*p*).

t (p, df)
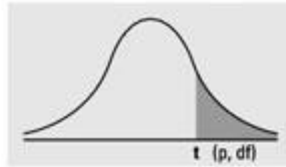
df/p	0.40	0.25	0.10	0.05	0.025	0.01	0.005	0.0005
1	0.324920	1.000000	3.077684	6.313752	12.70620	31.82052	63.65674	636.6192
2	0.288675	0.816497	1.885618	2.919986	4.30265	6.96456	9.92484	31.5991
3	0.276671	0.764892	1.637744	2.353363	3.18245	4.54070	5.84091	12.9240
4	0.270722	0.740697	1.533206	2.131847	2.77645	3.74695	4.60409	8.6103
5	0.267181	0.726687	1.475884	2.015048	2.57058	3.36493	4.03214	6.8688
6	0.264835	0.717558	1.439756	1.943180	2.44691	3.14267	3.70743	5.9588
7	0.263167	0.711142	1.414924	1.894579	2.36462	2.99795	3.49948	5.4079
8	0.261921	0.706387	1.396815	1.859548	2.30600	2.89646	3.35539	5.0413
9	0.260955	0.702722	1.383029	1.833113	2.26216	2.82144	3.24984	4.7809
10	0.260185	0.699812	1.372184	1.812461	2.22814	2.76377	3.16927	4.5869
11	0.259556	0.697445	1.363430	1.795885	2.20099	2.71808	3.10581	4.4370
12	0.259033	0.695483	1.356217	1.782288	2.17881	2.68100	3.05454	43178
13	0.258591	0.693829	1.350171	1.770933	2.16037	2.65031	3.01228	4.2208
14	0.258213	0.692417	1.345030	1.761310	2.14479	2.62449	2.97684	4.1405
15	0.257885	0.691197	1.340606	1.753050	2.13145	2.60248	2.94671	4.0728
16	0.257599	0.690132	1.336757	1.745884	2.11991	2.58349	2.92078	4.0150
17	0.257347	0.689195	1.333379	1.739607	2.10982	2.56693	2.89823	3.9651
18	0.257123	0.688364	1.330391	1.734064	2.10092	2.55238	2.87844	3.9216
19	0.256923	0.687621	1.327728	1.729133	2.09302	2.53948	2.86093	3.8834
20	0.256743	0.686954	1.325341	1.724718	2.08596	2.52798	2.84534	3.8495
21	0.256580	0.686352	1.323188	1.720743	2.07961	2.51765	2.83136	3.8193
22	0.256432	0.685805	1.321237	1.717144	2.07387	2.50832	2.81876	3.7921
23	0.256297	0.685306	1.319460	1.713872	2.06866	2.49987	2.80734	3.7676
24	0.256173	0.684850	1.317836	1.710882	2.06390	2.49216	2.79694	3.7454
25	0.256060	0.684430	1.316345	1.708141	2.05954	2.48511	2.78744	3.7251
26	0.255955	0.684043	1.314972	1.705618	2.05553	2.47863	2.77871	3.7066
27	0.255858	0.683685	1.313703	1.703288	2.05183	2.47266	2.77068	3.6896
28	0.255768	0.683353	1.312527	1.701131	2.04841	2.46714	2.76326	3.6739
29	0.255684	0.683044	1.311434	1.699127	2.04523	2.46202	2.75639	3.6594
30	0.255605	0.682756	1.310415	1.697261	2.04227	2.45726	2.75000	3.6460
z	0.253347	0.674490	1.281552	1.644854	1.95996	2.32635	2.57583	3.2905
CI	———	———	80%	90%	95%	98%	99%	99.9%
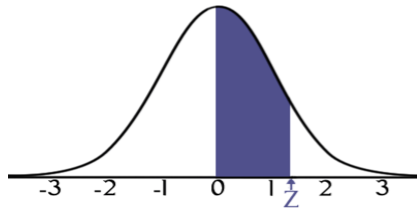
STANDARD NORMAL TABLE (Z)

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