BACHELOR OF INFORMATION TECHNOLOGY (HONS)

FINAL EXAMINATION
SEPTEMBER 2021

Course : EB3125 (Statistics)

Time: 2.00 pm – 5.00 pm
(3 hours)

Lecturer : Nur Suaidah Rosli

Date : 11 January 2022

Instructions:

Answer **ALL** questions.

This examination paper is confidential. The questions must be answered individually. Students are NOT PERMITTED to discuss or consult with other students or individuals.

Using Google is not allowed at all. Thus, the answer from the Internet will be considered plagiarism. Plagiarism is an offence. University guidelines on plagiarism will apply.

All exams submitted are final. Students will NOT BE PERMITTED to submit any additional work or alternative version, even if time is remaining. Only the initial submission will be forwarded for grading.

Your answer MUST be submitted within the stipulated time. Failure to submit your answers within the deadline given may result in the award of zero marks. You will be given an additional 30 minutes at the end of the specified exam duration. This extra time is for you to submit your completed exam. It's not intended as extra working time. If you experience technical difficulties, you can use this time at your own discretion, but you must leave sufficient time to submit your completed exam.

<u>Answer Format:</u>

i. Do not put your name on any materials related to the exam. Use only your Student ID Number for identification.
ii. All answers must be handwritten, scanned (using Camscanner) and converted to PDF file.
iii. Save your answers in the following format: **STUDENT ID_COURSE CODE_COURSE TITLE**
iv. You are required to cc your email to BIT_PIC2@nilai.edu.my.

Honor Pledge for Exams

"I affirm that I have not given or received any unauthorised help on this exam, and that all work is my own."

Name and Signature: _____

This question paper consists of **6** pages.
(excluding front cover)

1. a. In a game, a group of players obtained scores as shown in the table below. **(9 MARKS)**

Score	4	5	6	7	8
Number of players	2	4	9	7	***x***

Given that the mean score is 6.5, find the value of ***x***. With this value of ***x***, calculate the standard deviation of the sample.

b. The amount of rainfall for 75 days in a particular year were measured correct to the nearest millimeter (mm). **(11 MARKS)**

Amount of rainfall, x	**Frequency, f**
0 – 5	2
5 – 10	5
10 – 15	7
15 – 20	13
20 – 25	21
25 – 30	16
30 – 35	8
35 – 40	3

Find the mean amount of rainfall and the standard deviation of the sample. By calculating Pearson's coefficient of skewness, state the type of distribution for the above data.

2. a. A machine shop has an experienced machinist and an apprentice. The experience machinist produced 10 items of which only one is defective while the apprentice produced 8 items of which 2 are defective. Unaware of this, a buyer randomly selects one of these items. What is the probability that the item was machined by the apprentice? If the item is found to be defective, what is the probability that it was machined by the apprentice? **(5 MARKS)**

b. During an epidermic of a certain disease, a doctor was consulted by 100 people suffering from symptoms commonly associated with the disease. Of the 100 people, 40 are females of whom 15 have the disease and 25 do not. 20 males have the disease and the rest do not. A person is selected at random. Let M denote the event that this person is a male and D denote the event that this person is suffering from the disease. Evaluate

i. $P(D)$ **(2 MARKS)**

ii. $P(M \cap D)$ **(2 MARKS)**

iii. $P(M/D)$ **(3 MARKS)**

c. A bicycle shop's records show that X, the number of bicycles sold per week has the following distribution. **(8 MARKS)**

Number of bicycles	0	1	2	3	4
Relative frequency	0.04	0.24	0.33	0.36	0.03

Calculate the expected values and the standard deviations of bicycles sold per week.

3. a. A person has five keys on a ring, just one of which opens a lock. He selects one key after another at random without replacement. State the possible values of X, the number of keys he selects, including the one that opens the lock. Draw a table showing the probability distribution of X. Find the expected numbers of keys the person needs to try till open the lock. Find Var (X). **(10 MARKS)**

b. A proofreader found that after having corrected 50 pages, there are on average 2 errors per 5 pages. Find the poisson distribution of the random variable associated with the number of errors per page. Tabulate the probability of 0, 1, 2, 3 and 4 or more errors per page. **(6 MARKS)**

c. If the probability that a new employee in a garbage disposal company is still working with the company after 1 year is 0.55, what is the probability that out of 10 newly hired people,

i. 7 will still be with company after 1 year **(2 MARKS)**

ii. 7 or more will still be with company after 1 year **(2 MARKS)**

4. a. There are five sales representatives at Ford Corporation. Listed below are the five representatives and the number of cars they sold last week.

Sales representatives	Cars sold
Pete Hankish	8
Connie Stalter	6
Ron Eaton	4
Jean Twenge	10
Andy Treese	6

i. What is the population mean? **(2 MARKS)**

ii. List all the possible samples of size two (without replacement) that can be selected from this population. Calculate the mean for each of these samples. Write the sampling distribution of a sample mean. **(8 MARKS)**

b. A researcher wishes to estimate the number of days it takes an automobile dealer to sell a Chevrolet Aveo. A sample of 50 cars had a mean time on the dealer's lot of 54 days. Assume the population standard deviation to be 6.0 days. Find the best point estimate of the population mean and the 95% confidence interval of the population mean (Express answer rounded to 3 decimal places.) [Hint: $\bar{X} \pm Z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right)$] **(5 MARKS)**

c. A survey of 30 emergency room patients found that the average waiting time for treatment was 174.3 minutes. Assuming that the population standard deviation is 46.5 minutes, find the best point estimate of the population mean and the 99% confidence of the population mean. (Express answer rounded to 3 decimal places.) [Hint: $\bar{X} \pm Z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right)$] **(5 MARKS)**

5. a. The Medical Rehabilitation Education Foundation reports that the average cost of rehabilitation for stroke victims is $24,672. To see if the average cost of rehabilitation is different at a particular hospital, a researcher selects a random sample of 35 stroke victims at the hospital and finds the average cost of their rehabilitation is $26,343. The standard deviation of the population is $3251. At α=0.01, can it be concluded that the average cost of stroke rehabilitation at a particular hospital is different from $24,672? **(5 MARKS)**

b. A study was carried out to determine the relationship between the age and the time (in minutes) needed to run a 12 kilometers marathon event. Table below shows the data recorded.

Age (years), x	40	50	66	45	61	48	50	46
Time (minutes), y	61	81	92	70	87	76	88	69

i. Draw the scatter plot for the data given. **(4 MARKS)**

ii. Calculate the correlation coefficient and interpret. **(5 MARKS)**

iii. Estimate a regression line to predict the age and the time (in minutes) **(6 MARKS)**

-END OF QUESTION PAPER-

FORMULAE

UNGROUPED DATA	GROUPED DATA
Mean, $\bar{x} = \dfrac{\sum f}{n}$ Sample Variance, $s^2 = \dfrac{\sum x^2 - \dfrac{\left(\sum x\right)^2}{n}}{n-1}$ Standard deviation, $s = \sqrt{s^2}$	Mean, $\overline{x} = \frac{\sum f x_m}{n}$ Median, MD $= L + \left(\dfrac{\frac{n}{2} - C_f}{f}\right)C$ Sample Variance , $s^2 = \dfrac{\sum X_m{}^2 f - \dfrac{\left(\sum X_m f\right)^2}{n}}{n-1}$ Standard deviation, $s = \sqrt{s^2}$

PROBABILITY	CONDITIONAL PROBABILITY

Complement Rule
$P\left(\overline{A}\right) = 1 - P(A)$
 	
A and B are mutually exclusive events
$P(A \cup B) = P(A) + P(B)$
 	
A and B are mutually non exclusive events
$P\left(A \cup B\right) = P(A) + P(B) - P(A \cap B)$
	P (A | B) = $\dfrac{P\left(A \cap B\right)}{P(B)}$
	
	If A and B are independent, then
	$P(A \cap B) = P(A) \cdot P(B)$
	
	If A and B are dependent, then
	$P(A \cap B) = P(B) \cdot P(B/A)$

BINOMIAL DISTRIBUTION	DISCRETE RANDOM VARIABLE
$P(X = x) = {}^nC_x\,(p)^x\,(q)^{n-x} = \dfrac{n!}{x!(n-x)!}\,p^x(1-p)^{n-x}$ $\mu = np\,;\qquad \sigma^2 = np(1-p)$	$E(X) = \mu = \sum X \cdot P(X)$ $V(X) = \sigma^2 = \sum\left[X^2 \cdot P(X)\right] - \mu^2$

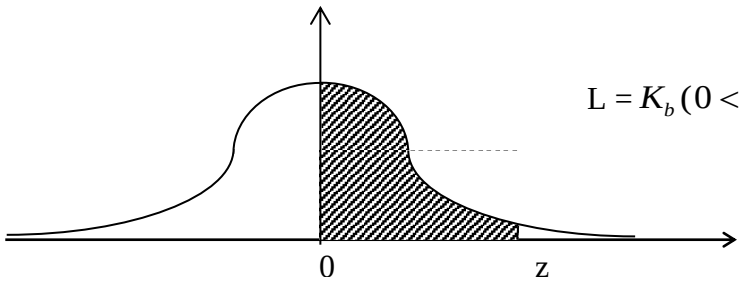
STANDARD NORMAL DISTRIBUTION	POISSON DISTRIBUTION
$z = \dfrac{x - \mu}{\sigma}$	P (X = x) = $\dfrac{e^{-\lambda}\,\lambda^x}{x!}$

EQUATION OF THE REGRESSION LINE	CORRELATION COEFFICIENT
$y' = a + bx$ $a = \dfrac{\left(\sum y\right)\left(\sum x^2\right) - \left(\sum x\right)\left(\sum xy\right)}{n\left(\sum x^2\right) - \left(\sum x\right)^2}$ $b = \dfrac{n\left(\sum xy\right) - \left(\sum x\right)\left(\sum y\right)}{n\left(\sum x^2\right) - \left(\sum x\right)^2}$	$r = \dfrac{n\left(\sum xy\right) - \left(\sum x\right)\left(\sum y\right)}{\sqrt{\left[n\left(\sum x^2\right) - \left(\sum x\right)^2\right]\left[n\left(\sum y^2\right) - \left(\sum y\right)^2\right]}}$

POPULATION MEAN	SAMPLE MEAN
$\mu = \sum X \cdot P(X)$ $\sigma^2 = \sum\left[X^2 \cdot P(X)\right] - \mu^2$ $\sigma = \sqrt{\sigma^2}$	$\mu_{\bar{x}} = \sum \overline{X} \cdot P\left(\overline{X}\right)$ $\sigma_{\bar{x}}{}^2 = \sum\left[\overline{X}^2 \cdot P\left(\overline{X}\right)\right] - \mu_{\bar{x}}{}^2$ $\sigma_{\bar{x}} = \sqrt{\sigma_{\bar{x}}{}^2}$

THE STANDARD NORMAL DISTRIBUTION TABLE

Area under the standard normal curve from 0 to z



$$L = K_b(0 < Z \le z) = \Phi(z) = \int_0^z \frac{1}{\sqrt{2\pi}} e^{\frac{-z^2}{2}}\, dz$$

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	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0635	0.0675	0.0714	0.0754
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	0.2612	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2996	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**	**0.3531**	**0.3554**	**0.3577**	**0.3599**	**0.3621**
1.1	0.3643	0.3665	03686	0.3708	0.3729	0.3750	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	0.4516	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	0.4998	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	0.4974	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	0.4996
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
3.5	0.4998	0.4998	0.4988	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998
3.6	0.4998	0.4998	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.7	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.8	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.9	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000