CONFIDENTIAL

Infrastructure University Kuala Lumpur

FINAL EXAMINATION
MARCH SEMESTER 2016

BACHELOR OF INFORMATION TECHNOLOGY (HONS)
IN NETWORK TECHNOLOGY
BACHELOR OF SOFTWARE ENGINEERING (HONS)
BACHELOR OF COMPUTER SCIENCE (HONS)
BACHELOR OF BUSINESS ADMINISTRATION (HONS)
IN E-COMMERCE
BACHELOR OF BUSINESS ADMINISTRATION (HONS)
BACHELOR OF ACCOUNTANCY (HONS)

INTRODUCTION TO STATISTICS
(BMS 101)

(TIME : 3 HOURS)

MATRIC NO. : | | | | | | | | | |

IC. / PASSPORT NO. : | | | | | | | | | | | | | |

LECTURER : **NAZIZ NASHRIQ BIN NIJAR**

GENERAL INSTRUCTIONS

1. This question booklet consists of 12 printed pages including this page.
2. Answer ALL questions in **SECTION A** in the **ANSWER BOOKLET**.
3. Answer ANY TWO (2) questions in **SECTION B** in the **ANSWER BOOKLET**.

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INSTRUCTIONS: **TIME:** ***3 HOURS***

SECTION A **(60 MARKS)**

There are TEN (10) questions in this section. Answer ALL questions in the Answer Booklet.

1. (a) Determine whether the data set is a population or a sample.

   (i) A survey of 1353 American households found that 18% of the households own a computer. (1 mark)

   (ii) A survey of each elementary school children found that 28% of the children could be classified as obese. (1 mark)

   (b) Identify the data set's level of measurement for the following statement:

   (i) the years the summer Olympics were held in the United States. (1 mark)

   (ii) the ratings of a movie ranging from 'poor' to 'good' to 'excellent'. (1 mark)

   (iii) hair color of women on a high school tennis team. (1 mark)

   (iv) the annual salaries for all lecturer in IUKL. (1 mark)

2. The Highway Patrol, using radar, checked the speeds (in mph) of 30 passing motorists at a checkpoint. The results are listed below.

   44 38 41 50 36 36 43 42 49 48

   35 40 37 41 43 50 45 45 39 38

   50 41 47 36 35 40 42 43 48 33

   Construct a frequency distribution and a cumulative frequency distribution. (6 marks)

3. Find the sample mean, median, and mode of the following numbers:

88 91 84 88 81 89 88 82 83 86 (6 marks)

4. In a random sample, 10 students were asked to compute the distance they travel one way to school to the nearest tenth of a mile. The data is listed below. Compute the range, standard deviation and variance of the data.

1.1 5.2 3.6 5.0 4.8 1.8 2.2 5.2 1.5 0.8 (6 marks)

5. (a) A discrete random variable X has the following distribution.

X	0	1	2	3	4
$P(X=x)$	$\frac{4}{27}$	$\frac{1}{27}$	$\frac{5}{9}$	r	$\frac{5}{27}$

Determine the value of r. (2 marks)

(b) The random variable X represents the number of tests that a patient entering a hospital will have along with the corresponding probabilities. Find the mean and variance. (4 marks)

X	0	1	2	3	4
$P(X=x)$	$\frac{3}{17}$	$\frac{5}{17}$	$\frac{6}{17}$	$\frac{2}{17}$	$\frac{1}{17}$

6. (a) The probability that an individual is left-handed is 0.11. In a class of 40 students, what is the probability of finding five left-handers? (3 marks)

(b) According to police sources, a car with a certain protection system will be recovered 85% of the time. Find the probability that 5 of 7 stolen cars will be recovered. (3 marks)

7. (a) A sales firm receives an average of four calls per hour on its toll-free number. For any given hour, find the probability that it will receive exactly nine calls. Use the Poisson distribution. (3 marks)

(b) A car towing service company averages two calls per hour. Use the Poisson distribution to determine the probability that in a randomly selected hour the number of calls is three. (3 marks)

8. A table below presented the distribution of hair colour and grade in Mathematics for a group of students.

	Grade		
Hair Colour	A	B	C
Black	37	62	32
Brown	52	54	68

(a) What is the probability that a student has black hair or their grade in Mathematics is a B? (2 marks)

(b) What is the probability that a student has brown hair given that their grade in Mathematics is a C? (2 marks)

(c) Was the hair colour independent of Mathematics grade? Explain. (2 marks)

9. Evaluate the following:

(a) $P(Z > 1.25)$ (1 mark)

(b) $P(Z < -0.15)$ (1 mark)

(c) $P(Z > 2.5)$ (1 mark)

(d) $P(Z > -2.42)$ (1 mark)

(e) $P(-1.1 < Z < 2.1)$ (2 marks)

10. (a) The lengths of pregnancies are normally distributed with a mean of 267 days and a standard deviation of 15 days. Find the probability that they have lengths of pregnancies between 267 days and 269 days. (3 marks)

(b) Assume that the heights of women are normally distributed with a mean of 63.6 inches and a standard deviation of 2.5 inches. If 100 women are randomly selected, find the probability that they have a mean height greater than 63.0 inches. (3 marks)

SECTION B **(40 MARKS)**

There are THREE (3) questions in this section. Answer ANY TWO (2) questions in the Answer Booklet.

1. (a) Items leaving a production process are tested automatically, but it is known that the test is not completely reliable. Experience shows that 80% of the output is satisfactory and 20% defective. The probability that a satisfactory item fails the automatic test is 0.08 and the probability that a defective item fails the automatic test is 0.98.

Calculate the probability that a randomly selected item leaving the process

(i) is satisfactory and fails the test; (2 marks)

(ii) does not fail the test; (4 marks)

(iii) is defective, given that it fails the test. (3 marks)

(b) In ABC company, there are 50 employees. Each employee travels to work every morning in his or her own car. The distribution of the driving times (in minutes) from home to work for the employees is shown in the table below.

Driving Times (minutes)	1 – 10	11 – 20	21 – 30	31 – 40	41 – 50
Number of Employees	8	14	12	9	7

Calculate

(i) mean; (2 marks)

(ii) median; (3 marks)

(iii) mode. (3 marks)

(c) In a random sample of 18 one-person tents, the mean price was RM144.19 and standard deviation was RM61.32. Construct a 99% confidence interval for the population mean price. Assume the prices are normally distributed. (3 marks)

2. (a) A researcher reports that average salary of assistant professor is more than RM10000. A sample of 35 assistant professors has a mean salary of RM11260. At $\alpha = 0.05$, can you reject the researcher's claim? The standard deviation of the population is RM3240. (7 marks)

(b) The length of life of an instrument produced by a machine has a normal distribution with a mean of 12 months and standard deviation of 2 months. Find the probability that an instrument produced by this machine will last

(i) less than 7 months. (3 marks)

(ii) between 8 and 15 months. (3 marks)

(c) Based on data from the National Health and Nutrition Examination Survey, assume that weights of men are normally distributed with mean of 98 kg and standard deviation of 25 kg.

(i) Find the probability that if an individual man is randomly selected, his weight will be greater than 105 kg. (3 marks)

(ii) Find the probability that 25 randomly selected men will have a mean weight that is less than 80 kg. (4 marks)

3. The table below gives information on CGPA (cumulative grade point average) and starting salaries (thousand ringgit) of seven recent university graduates.

CGPA	2.90	3.81	3.20	2.42	3.94	2.05	2.25
Starting salary	28	38	28	25	40	21	27

(a) Determine the independent variable and dependent variable for the above data. Do you expect a positive or negative relationship between these two variables? (2 marks)

(b) Show that correlation coefficient for given data above is 0.9416. (5 marks)

(c) Calculate coefficient of determination. Interpret your answer. (3 marks)

(d) Find the equation of the regression line for data above. (5 marks)

(e) Find the standard error of estimate. (3 marks)

(f) Use the regression equation to predict the value of starting salary when CGPA is 3.67. If the CGPA is not meaningful to predict the value of starting salary, explain your reason. (2 marks)

***** END OF QUESTIONS *****

FORMULA SHEET

$$\mu = \frac{\sum x}{N}$$

$$S_k = \frac{\text{mean - mode}}{\text{standard deviation}}$$

$$\bar{x} = \frac{\sum x}{n}$$

$$E(X) = \sum xP(X = x)$$

$$\text{Mean} = \frac{\sum f.x}{n}$$

$$Var(X) = E(X^2) - [E(X)]^2$$

$$\text{Median} = L_m + \frac{(\frac{n}{2} - CF_{m-1})w_m}{f_m}$$

$$P(X = x) = {}^nC_x (p)^x (q)^{n-x}$$

$$\text{Mode} = L_m + (\frac{D_1}{D_1 + D_2})w_m$$

$$P(X = x) = \frac{e^{-\lambda}\lambda^x}{x!}$$

$$\sigma^2 = \frac{\sum x^2 - \frac{(\sum x)^2}{N}}{N}$$

$$Z = \frac{X - \mu}{\sigma}$$

$$s^2 = \frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n-1}$$

$$Z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}}$$

$$\sigma^2 = \frac{\sum fx^2 - \frac{(\sum fx)^2}{N}}{N}$$

$$E = t_c \frac{s}{\sqrt{n}}$$

$$s^2 = \frac{\sum fx^2 - \frac{(\sum fx)^2}{n}}{n-1}$$

$$E = z_c \frac{\sigma}{\sqrt{n}}$$

$$\bar{x} - E < \mu < \bar{x} + E$$

FORMULA SHEET

$$\text{CV} = \frac{\text{standard deviation}}{\text{mean}} \times 100\%$$

$$r = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{n\sum x^2 - (\sum x)^2}.\sqrt{n\sum y^2 - (\sum y)^2}}$$

$$S_k = \frac{3(\text{mean - median})}{\text{standard deviation}}$$

$$b_1 = \frac{\sum x_i y_i - \frac{(\sum x_i)(\sum y_i)}{n}}{\sum x_i^2 - \frac{(\sum x_i)^2}{n}}$$

$$b_0 = \frac{1}{n}\left(\sum y_i - b_1 \sum x_i\right)$$

$$s_e = \sqrt{\frac{\sum (y_i - \hat{y}_i)^2}{n-2}}$$

$$E = t_c s_e \sqrt{1 + \frac{1}{n} + \frac{n(x_0 - \bar{x})^2}{n\sum x^2 - (\sum x)^2}}$$

$$P(E) = \frac{n(E)}{n(S)}$$

$$P(\overline{E}) = 1 - P(E)$$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(B|A) = \frac{P(A \cap B)}{P(A)}$$

$$P(A \cap B) = P(A) \times P(B)$$

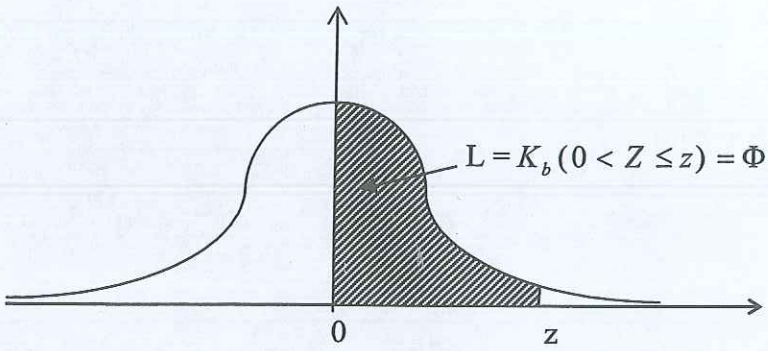
$$\text{Range} = \text{highest value} - \text{lowest value}$$

$$k = 1 + 3.3 \log n$$

$$\text{Class width} \geq \frac{\text{range}}{\text{number of class intervals}}$$

THE STANDARD NORMAL DISTRIBUTION TABLE

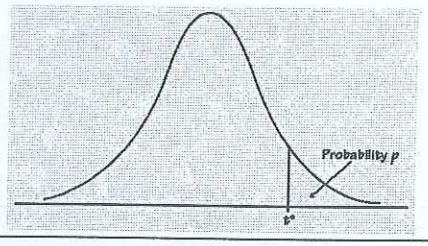
Area under the standard normal curve from 0 to z



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

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	0.4898	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	0.4974	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

t Distribution



	Tail probability, p											
df	**.25**	**.20**	**.15**	**.10**	**.05**	**.025**	**.02**	**.01**	**.005**	**.0025**	**.001**	**0.0005**
1	1.000	1.376	1.963	3.078	6.314	12.71	15.89	31.82	63.66	127.3	318.3	636.6
2	0.816	1.061	1.386	1.886	2.920	4.303	4.849	6.965	9.925	14.09	22.33	31.6
3	0.765	0.978	1.250	1.638	2.353	3.182	3.482	4.541	5.841	7.453	10.21	12.92
4	0.741	0.941	1.190	1.533	2.132	2.776	2.999	3.747	4.604	5.598	7.173	8.61
5	0.727	0.920	1.156	1.476	2.015	2.571	2.757	3.365	4.032	4.773	5.893	6.869
6	0.718	0.906	1.134	1.440	1.943	2.447	2.612	3.143	3.707	4.317	5.208	5.959
7	0.711	0.896	1.119	1.415	1.895	2.365	2.517	2.998	3.499	4.029	4.785	5.408
8	0.706	0.889	1.108	1.397	1.860	2.306	2.449	2.896	3.355	3.833	4.501	5.041
9	0.703	0.883	1.100	1.383	1.833	2.262	2.398	2.821	3.250	3.690	4.297	4.781
10	0.700	0.879	1.093	1.372	1.812	2.228	2.359	2.764	3.169	3.581	4.144	4.587
11	0.697	0.876	1.088	1.363	1.796	2.201	2.328	2.718	3.106	3.497	4.025	4.437
12	0.695	0.873	1.083	1.356	1.782	2.179	2.303	2.681	3.055	3.428	3.930	4.318
13	0.694	0.870	1.079	1.350	1.771	2.160	2.282	2.650	3.012	3.372	3.852	4.221
14	0.692	0.868	1.076	1.345	1.761	2.145	2.264	2.624	2.977	3.326	3.787	4.14
15	0.691	0.866	1.074	1.341	1.753	2.131	2.249	2.602	2.947	3.286	3.733	4.073
16	0.690	0.865	1.071	1.337	1.746	2.120	2.235	2.583	2.921	3.252	3.686	4.015
17	0.689	0.863	1.069	1.333	1.740	2.110	2.224	2.567	2.898	3.222	3.646	3.965
18	0.688	0.862	1.067	1.330	1.734	2.101	2.214	2.552	2.878	3.197	3.611	3.922
19	0.688	0.861	1.066	1.328	1.729	2.093	2.205	2.539	2.861	3.174	3.579	3.883
20	0.687	0.860	1.064	1.325	1.725	2.086	2.197	2.528	2.845	3.153	3.552	3.85
21	0.686	0.859	1.063	1.323	1.721	2.080	2.189	2.518	2.831	3.135	3.527	3.819
22	0.686	0.858	1.061	1.321	1.717	2.074	2.183	2.508	2.819	3.119	3.505	3.792
23	0.685	0.858	1.060	1.319	1.714	2.069	2.177	2.500	2.807	3.104	3.485	3.768
24	0.685	0.857	1.059	1.318	1.711	2.064	2.172	2.492	2.797	3.091	3.467	3.745
25	0.684	0.856	1.058	1.316	1.708	2.060	2.167	2.485	2.787	3.078	3.450	3.725
26	0.684	0.856	1.058	1.315	1.706	2.056	2.162	2.479	2.779	3.067	3.435	3.707
27	0.684	0.855	1.057	1.314	1.703	2.052	2.158	2.473	2.771	3.057	3.421	3.69
28	0.683	0.855	1.056	1.313	1.701	2.048	2.154	2.467	2.763	3.047	3.408	3.674
29	0.683	0.854	1.055	1.311	1.699	2.045	2.150	2.462	2.756	3.038	3.396	3.659
30	0.683	0.854	1.055	1.310	1.697	2.042	2.147	2.457	2.750	3.030	3.385	3.646
40	0.681	0.851	1.050	1.303	1.684	2.021	2.123	2.423	2.704	2.971	3.307	3.551
50	0.679	0.849	1.047	1.299	1.676	2.009	2.109	2.403	2.678	2.937	3.261	3.496
60	0.679	0.848	1.045	1.296	1.671	2.000	2.099	2.390	2.660	2.915	3.232	3.46
80	0.678	0.846	1.043	1.292	1.664	1.990	2.088	2.374	2.639	2.887	3.195	3.416
100	0.677	0.845	1.042	1.290	1.660	1.984	2.081	2.364	2.626	2.871	3.174	3.390
1000	0.675	0.842	1.037	1.282	1.646	1.962	2.056	2.330	2.581	2.813	3.098	3.300
∞	0.674	0.841	1.036	1.282	1.645	1.960	2.054	2.326	2.576	2.807	3.091	3.291
	50%	**60%**	**70%**	**80%**	**90%**	**95%**	**96%**	**98%**	**99%**	**99.5%**	**99.8%**	**99.9%**
	Confidence level, C											