SULIT

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENGAJIAN TINGGI

JABATAN MATEMATIK, SAINS & KOMPUTER

PENILAIAN ALTERNATIF

SESI 1 : 2021/2022

BBM30093 : PROBABILITY & STATISTICS FOR ENGINEERING TECHNOLOGY

NAMA PENYELARAS KURSUS : ZURAIDAH BINTI OMAR

KAEDAH PENILAIAN : PEPERIKSAAN ONLINE

JENIS PENILAIAN : SOALAN STRUKTUR (2 SOALAN)

TARIKH PENILAIAN : 26 JANUARI 2022

TEMPOH PENILAIAN : (2 JAM)

LARANGAN TERHADAP PLAGIARISM (AKTA 174)
PELAJAR TIDAK BOLEH MEMPLAGIAT APA-APA IDEA, PENULISAN, DATA ATAU CIPTAAN ORANG LAIN. PLAGIAT ADALAH SALAH SATU PENYELEWENGAN AKADEMIK. SEKIRANYA PELAJAR DIBUKTIKAN MELAKUKAN PLAGIARISM, PENILAIAN BAGI KURSUS BERKENAAN AKAN DIMANSUHKAN DAN DIBERI GRED F DENGAN NILAI MATA 0.
(RUJUK BUKU ARAHAN-ARAHAN PEPERIKSAAN DAN KAEDAH PENILAIAN (Sarjana Muda), EDISI 2 2020, KLAUSA 15, & 16)

INSTRUCTION:

This section consists of **TWO (2)** subjective questions. Answer **ALL** questions.Write your answers in the Alternative Assessment answer sheet.

ARAHAN :

*Bahagian ini mengandungi **DUA (2)** soalan subjektif. Jawab semua soalan. Tulis jawapan anda di dalam kertas jawapan Penilaian Alternatif.*

QUESTION 1

SOALAN 1

CLO2
C3

a) In a mathematics class there are 9 juniors and 16 seniors. 6 of the juniors are female and 5 of the seniors are male. If the students are selected randomly, calculate the probability of selecting the following:

Dalam kelas matematik terdapat 9 junior dan 16 senior. 6 orang junior adalah perempuan dan 5 orang senior adalah lelaki. Jika seorang pelajar dipilih secara rawak, hitung kebarangkalian untuk memilih yang berikut

i) A junior or a senior [2 mark]
Seorang junior atau senior [2 *markah*]

ii) A senior or a male [4 marks]
Seorang senior atau lelaki [*4 markah*]

iii) A junior or a female [4 marks]
Seorang junior atau perempuan [4 *markah*]

CLO2
C3

b) Table shows the probability normal distributions of a random variable X.
Jadual menunjukkan kebarangkalian taburan normal bagi pembolehubah rawak X

X	0	1	2	3	4	5
P(X= x)	0.15	0.25	0.1	h	0.16	0.2

i) Calculate the value of h. [2 marks]
Hitung nilai h. [*2 markah*]

ii) Calculate the expected value and the variance of X. [4 marks]
Kira nilai jangkaan dan varians bagi X. [4 *markah*]

iii) Calculate P $(2 \leq X \leq 5)$ [4 marks]
Kira P $(2 \leq X \leq 5)$ [4 *markah*]

QUESTION 2

SOALAN 2

CLO2
C3

a) Construct the 95% confidence interval for the variance and standard deviation. A random sample of the age in years of building of 10 Minimarts in Kluang, Johor has been taken. Assume the distribution is approximately normal.

Bina selang keyakinan 95% untuk varians dan sisihan piawai. Sampel rawak umur bangunan dalam tahun 10 minimart di Kluang, Johor telah diambil. Andaikan taburan adalah lebih kurang normal.

14	13	2	10	4
3	8	11	12	7

[10 marks]

[*10 markah*]

CLO2
C3

b) A researcher wishes to test the claim that the average age of nurses in hospital is different than 35 years. He selects a sample of 16 nurses and finds the mean of the sample to be 34.6 years, with a sample standard deviation of 2.5 years. Use $\alpha = 0.05$, is there any evidence to support the claims?

Seorang penyelidik ingin menguji dakwaan bahawa purata umur jururawat di hospital berbeza daripada 35 tahun. Dia memilih sampel 16 jururawat dan mendapati min sampel ialah 34.6 tahun. Gunakan $\alpha = 0.05$, adakah terdapat bukti untuk menyokong tuntutan tersebut ?

[10 marks]

[*10 markah*]

CLO2
C3

c) A survey found that the average homestay rate in Selangor is RM300 and the average homestay in Kelantan is RM295. Assume that the data were obtained from two samples of 40 homestays each and that the standard deviations of the populations are RM6.50 and RM5.25 respectively. Use $\alpha = 0.05$, can it be concluded that there is a significant difference in the rates?

Tinjauan mendapati kadar purate homestay di Selangor ialah RM300 dan purata homestay di Kelantan ialah RM295. Andaikan data diperolehi daripada dua sampel 40 homestay setiap satu dan sisihan piawai populasi masing-masing ialah Rm6.50 dan Rm5.25. Gunakan $\alpha = 0.05$, bolehkah disimpulkan bahawa terdapat perbezaan yang signifikan dalam kadar ?.

[10 marks]

[*10 markah*]

SOALAN TAMAT

FORMULA SHEET

PROBABILITY & STATISTICS

Addition Rule (mutually exclusive events),
$$P(A \cup B) = P(A) + P(B)$$

Addition Rule (events not mutually exclusive),
$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

Multiplication Rule (Independent event),
$$P(A \cap B) = P(A) \cdot P(B)$$

Multiplication Rule(dependent event),
$$P(A \cap B) = P(A).P(B|A)$$

Mean for a probability distribution,
$$\mu = \sum [X \cdot P(X)]$$

Variance for a probability distribution.
$$\sigma^2 = \sum [X^2.P(X)] - \mu^2$$

Standard deviation for a probability distribution.
$$\sigma = \sqrt{\sum [X^2.P(X)] - \mu^2}$$

Expectation of Discrete Random Variable,
$$E(X) = \sum [X.P(X)]$$

Variance of Discrete Random Variable
$$Var\,(X) = E(X^2) - [E(X)]^2$$

Where $E(X^2) = \sum x^2.P(X = x)$

Binomial probability,
$$P(X) = \frac{n!}{(n-X)!\,X!} \cdot p^x \cdot q^{n-x}$$

Mean for binomial distribution, $\mu = np$

Variance and standard deviation for the binomial distribution, $\sigma^2 = npq \;\; \sigma = \sqrt{npq}$

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

Complementary events, $P(\overline{A}) = 1 - P(A)$

Permutation Rule, ${}_nP_r = \frac{n!}{(n-r)!}$

Combination Rule, ${}_nC_r = \frac{n!}{(n-r)!r!}$

Normal distribution

Standard score, $z = \frac{X-\mu}{\sigma}$ or $\frac{X-\overline{X}}{s}$

Mean of sample mean, $\mu_{\overline{X}} = \mu$

Standard error of the means, $\sigma_{\overline{x}} = \frac{\sigma}{\sqrt{n}}$

Central limit theorem formula, $z = \frac{X-\mu}{\sigma/\sqrt{n}}$

SAMPLING AND ESTIMATION

z confidence interval for means,

$$\overline{X} - z\alpha_{/2}\left(\frac{\sigma}{\sqrt{n}}\right) < \mu < \overline{X} + z\alpha_{/2}\left(\frac{\sigma}{\sqrt{n}}\right)$$

t confidence interval for means,

$$\overline{X} - t\alpha_{/2}\left(\frac{s}{\sqrt{n}}\right) < \mu < \overline{X} + t\alpha_{/2}\left(\frac{s}{\sqrt{n}}\right)$$

Sample size for means, $n = \left(\frac{z_{\alpha/2}\cdot\sigma}{E}\right)^2$, where E is the maximum error of estimate.

Confidence interval for a proportion,

$$\hat{p} - \left(z_{\alpha/2}\right)\sqrt{\frac{\hat{p}\hat{q}}{n}} < p < \hat{p} + \left(z_{\alpha/2}\right)\sqrt{\frac{\hat{p}\hat{q}}{n}}$$

Sample size for proportion, $n = \hat{p}\hat{q}\left(\frac{z_{\alpha/2}}{E}\right)^2$, where E is the maximum error of estimate.

Confidence interval for variance,

$$\frac{(n-1)s^2}{\chi^2_{right}} < \sigma^2 < \frac{(n-1)s^2}{\chi^2_{left}}$$

Confidence interval for standard deviation,

$$\sqrt{\frac{(n-1)s^2}{\chi^2_{right}}} < \sigma < \sqrt{\frac{(n-1)s^2}{\chi^2_{left}}}$$

HYPOTHESIS TESTING

Test for the population mean

z test, $Z = \frac{X-\mu}{\sigma/\sqrt{n}}$, variance known

z test, $Z = \frac{X-\mu}{s/\sqrt{n}}$, variance unknown

t test, $t = \frac{X-\mu}{s/\sqrt{n}}$,small sample

Test for two population mean:

Variances known

Test statistics, $Z = \frac{(\overline{x_1}-\overline{x_2})-(\mu_1-\mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}}}$

Variances unknown for large samples:

Test statistics, $Z = \frac{(\overline{x_1}-\overline{x_2})-(\mu_1-\mu_2)}{\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}}$

Variances unknown for small samples:

Test statistics, $t = \frac{(\overline{x_1}-\overline{x_2})-(\mu_1-\mu_2)}{\sqrt{s_p{}^2\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$

$where\ s_{P^2} = \frac{(n_1-1)S_1{}^2+(n_2-1)S_2{}^2}{n_1+n_2-2}$

Table G The Chi-Square Distribution

Degrees of freedom	α									
	0.995	**0.99**	**0.975**	**0.95**	**0.90**	**0.10**	**0.05**	**0.025**	**0.01**	**0.005**
1	—	—	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	9.236	11.071	12.833	15.086	16.750
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.344	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.299
13	3.565	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.629	6.571	7.790	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578	32.801
16	5.142	5.812	6.908	7.962	9.312	23.542	26.296	28.845	32.000	34.267
17	5.697	6.408	7.564	8.672	10.085	24.769	27.587	30.191	33.409	35.718
18	6.265	7.015	8.231	9.390	10.865	25.989	28.869	31.526	34.805	37.156
19	6.844	7.633	8.907	10.117	11.651	27.204	30.144	32.852	36.191	38.582
20	7.434	8.260	9.591	10.851	12.443	28.412	31.410	34.170	37.566	39.997
21	8.034	8.897	10.283	11.591	13.240	29.615	32.671	35.479	38.932	41.401
22	8.643	9.542	10.982	12.338	14.042	30.813	33.924	36.781	40.289	42.796
23	9.262	10.196	11.689	13.091	14.848	32.007	35.172	38.076	41.638	44.181
24	9.886	10.856	12.401	13.848	15.659	33.196	36.415	39.364	42.980	45.559
25	10.520	11.524	13.120	14.611	16.473	34.382	37.652	40.646	44.314	46.928
26	11.160	12.198	13.844	15.379	17.292	35.563	38.885	41.923	45.642	48.290
27	11.808	12.879	14.573	16.151	18.114	36.741	40.113	43.194	46.963	49.645
28	12.461	13.565	15.308	16.928	18.939	37.916	41.337	44.461	48.278	50.993
29	13.121	14.257	16.047	17.708	19.768	39.087	42.557	45.722	49.588	52.336
30	13.787	14.954	16.791	18.493	20.599	40.256	43.773	46.979	50.892	53.672
40	20.707	22.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691	66.766
50	27.991	29.707	32.357	34.764	37.689	63.167	67.505	71.420	76.154	79.490
60	35.534	37.485	40.482	43.188	46.459	74.397	79.082	83.298	88.379	91.952
70	43.275	45.442	48.758	51.739	55.329	85.527	90.531	95.023	100.425	104.215
80	51.172	53.540	57.153	60.391	64.278	96.578	101.879	106.629	112.329	116.321
90	59.196	61.754	65.647	69.126	73.291	107.565	113.145	118.136	124.116	128.299
100	67.328	70.065	74.222	77.929	82.358	118.498	124.342	129.561	135.807	140.169

Source: Donald B. Owen, *Handbook of Statistics Tables,* The Chi-Square Distribution Table, © 1962 by Addison-Wesley Publishing Company, Inc. Copyright renewal © 1990. Reprinted by permission of Pearson Education, Inc.

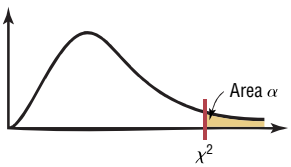

Table B-1 The Standard Normal Distribution

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	.2611	.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	.3830
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
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998

For *z* values greater than 3.49, use 0.4999.

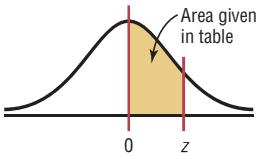

Table F The *t* Distribution

	Confidence intervals	80%	90%	95%	98%	99%
	One tail, α	0.10	0.05	0.025	0.01	0.005
d.f.	Two tails, α	0.20	0.10	0.05	0.02	0.01
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
32		1.309	1.694	2.037	2.449	2.738
34		1.307	1.691	2.032	2.441	2.728
36		1.306	1.688	2.028	2.434	2.719
38		1.304	1.686	2.024	2.429	2.712
40		1.303	1.684	2.021	2.423	2.704
45		1.301	1.679	2.014	2.412	2.690
50		1.299	1.676	2.009	2.403	2.678
55		1.297	1.673	2.004	2.396	2.668
60		1.296	1.671	2.000	2.390	2.660
65		1.295	1.669	1.997	2.385	2.654
70		1.294	1.667	1.994	2.381	2.648
75		1.293	1.665	1.992	2.377	2.643
80		1.292	1.664	1.990	2.374	2.639
90		1.291	1.662	1.987	2.368	2.632
100		1.290	1.660	1.984	2.364	2.626
500		1.283	1.648	1.965	2.334	2.586
1000		1.282	1.646	1.962	2.330	2.581
$(z)\ \infty$		1.282[a]	1.645[b]	1.960	2.326[c]	2.576[d]

[a] This value has been rounded to 1.28 in the textbook.
[b] This value has been rounded to 1.65 in the textbook.
[c] This value has been rounded to 2.33 in the textbook.
[d] This value has been rounded to 2.58 in the textbook.

Source: Adapted from W. H. Beyer, *Handbook of Tables for Probability and Statistics,* 2nd ed., CRC Press, Boca Raton, Fla., 1986. Reprinted with permission.