PAN AFRICA CHRISTIAN UNIVERSITY

SCHOOL OF HUMANITIES AND SOCIAL SCIENCES

END OF SEMESTER EXAMINATION FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN MARRIAGE & FAMILY THERAPY

MAY-AUGUST 2019

CAMPUS: ROYSAMBU

DEPARTMENT: COUNSELLING PSYCHOLOGY

COURSE CODE: PMFT721

COURSE TITLE: STATISTICS II

EXAM DATE: WEDNESDAY 7th AUGUST 2019

DURATION: 3 HOURS

TIME: 5:30PM-8:30PM

INSTRUCTIONS

- Read the instructions and questions carefully before you write the answers.
- Write your **STUDENT NUMBER** in the Answer Booklet given
- *Write clearly and legibly.*
- **Answer any <u>Three Questions</u> out of the Five provided**
- *ALL PAC University's examination rules and regulations apply*

QUESTION ONE

(a) Citing examples, explain the difference between a statistic and a parameter.

(5 marks)

(b) There is an increasing concern on the number of domestic violence cases reported annually in Kenya. A sample of 100 days this year revealed an average of 20 cases of domestic violence with a standard deviation of 4 cases reported. Determine the 95% confidence interval of domestic cases reported annually in Kenya. **(15 marks)**

QUESTION TWO

(a) Distinguish between an estimate and an estimator **(5 marks)**

(b) A firm conducts a study to determine if drug abuse among adolescents vary by family structures: those with both parents and those with single parents. A comparison is made of 150 teenagers from each category. The results show that 37 teenagers with both parents had abused drugs, while 52 of teenagers with single parent had abused drugs. Calculate a 95 percent confidence interval for the difference in the proportion of teenagers from the two categories who had abused drugs. What does this reveal about the tendency for drug abuse among the teenagers? **(15 marks)**

QUESTION THREE

(a) Explain the difference between type I and type II errors in testing a hypothesis.

(5 marks)

(b) A marketing major at a college wants to determine if there is any difference in the proportion of men who respond favorably to a certain advertisement and the proportion of women who do so. Out of 875 men, 412 reports a positive impression and out of 910 women, only 309 are receptive. If the marketing student tests for equality in population proportions, what will she conclude at $\alpha = 0.05$

(15 marks)

QUESTION FOUR

A management behavior analyst has been studying the relationship between male-female supervisory structures in the work place and the level of employee's job satisfaction. The results of a recent survey are shown in the table below:

Level of Satisfaction	**Boss/Employee Supervisory Structure**			
	Female/Male	Female/Female	Male/Male	Male/Female
Satisfied	21	25	54	71
Neutral	39	49	50	38
Dissatisfied	31	48	10	11

Is there sufficient evidence to infer that the level of job satisfaction depends on the boss-employee gender relationship? $\alpha = 0.1$ **(20 marks)**

QUESTION FIVE

An association of peer counselors wants to determine if three different training programs have different effects on their members' productivity levels. Fourteen members are randomly selected and assigned to one of the three programs. Upon completion of the training, each member is subjected to a test to determine his or her proficiency. Four members were placed in the first training program, and five in each of the other two. Each of these groups were treated as separate samples and used to draw inferences about the populations of members that might enter in to the respective training programs. The members' test scores after the training are shown below:

Program 1	85	72	83	80	
Program 2	80	84	81	78	82
Program 3	82	80	85	90	88

a) State the appropriate null and alternative hypothesis for determining whether a difference exists in the training programs offered. **(2 marks)**

b) Is there any difference in the effectiveness of the three programs at $\alpha = 0.05$?

(18 marks)

USEFUL FORMULAE

1. Z- scores:

$$Z = \frac{x_i - \mu}{\delta}$$

2. Confidence Interval for the population mean:

$\mu = \bar{x} \pm Z_{\alpha/2} S_{\bar{x}}$ where $\delta_{\bar{x}}$ is the standard error of the mean.

3. The standard error for the mean:

$\delta_{\bar{x}} = \frac{S}{\sqrt{n}}$, where S is the sample standard deviation and n is the sample size.

4. The standard error for the proportion:

$\delta_{\bar{p}} \sqrt{\frac{P(1-P)}{n}}$, where δ is the population standard deviation and n is the

5. Calculated statistic for a single mean:

$$Z_{cal} = \frac{\bar{x} - \mu}{\delta_{\bar{x}}}$$

6. Chi-square test statistic:

$\chi^2_{cal} = \sum \frac{(O-E)^2}{E}$, where O is the observed frequency and E is the expected frequency.

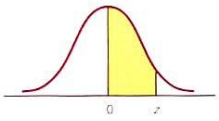
7. F-test statistic:

$F_{cal} = \frac{\delta_a^2}{\delta_w^2}$, where δ_a^2 and δ_w^2 are the variances among the sample means and within samples respectively. The variances are given as:

$\delta_a^2 = \frac{\sum n_i (\bar{X}_i - \mu)^2}{k-1}$ where μ is the grand mean and k is the number of samples; and

$\delta_w^2 = \frac{n_1 s_1^2 + n_2 s_2^2 + ... + n_k s_k^2}{(n_1 + n_2 + ... + n_k) - k}$ where s_i^2 represents the sample variance.

Table 3 Normal Probabilities



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

SOURCE: Abridged from Table 1 of A. Hald, *Statistical Tables and Formulas* (New York: Wiley & Sons, Inc.), 1952. Reproduced by permission of A. Hald and the publisher, John Wiley & Sons, Inc.