



**PAN AFRICA CHRISTIAN UNIVERSITY
SCHOOL OF HUMAN AND SOCIAL SCIENCES**

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

SEPTEMBER – DECEMBER 2017

CAMPUS: ROYSAMBU

DEPARTMENT: COUNSELING PSYCHOLOGY

COURSE CODE: PMFT121

COURSE TITLE: STATISTICS II

EXAM DATE: TUESDAY 5th DECEMBER 2017

TIME: 5.30PM-7.30PM

INSTRUCTIONS

- Read all questions carefully before attempting.
- Write your **student number** on the answer booklet provided.
- Answer any Three Questions out of the Five provided

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 marriages that break up within the first year of marriage. A sample of 100 couples within the first year of marriage reveal that 20 of them broke up with the first year of marriage. Determine the 95% confidence interval of the marriages that do not survive the first year of marriage. **(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 the adolescence is different among them from different 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 from both parents had abused drugs, while 52 of the single parent had abused drugs. Calculate a 90 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 of out 910 women, only 309 are receptive. If the marketing student tests for equality in population proportions, what will she conclude at $\alpha = 0.1$ **(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 job's 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

- State the appropriate null and alternative hypothesis for determining whether a difference exists in the training programs offered. **(2 marks)**
- Is there any difference in the effectiveness of the three programs at $\alpha = 0.05$? **(18 marks)**

USEFUL FORMULAE

- Z- scores:

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

- Confidence Interval for the population mean:

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

- The standard error for the mean:

$$\delta_x = \frac{S}{\sqrt{n}}, \text{ where } S \text{ is the sample standard deviation and } n \text{ is the sample size.}$$

- The standard error for the proportion:

$$\delta_p = \sqrt{\frac{P(1-P)}{n}}, \text{ where } \delta \text{ is the population standard deviation and } n \text{ is the}$$

- Calculated statistic for a single mean:

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

- Chi-square test statistic:

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

- F-test statistic:

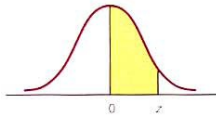
$$F_{cal} = \frac{\delta_a^2}{\delta_w^2}, \text{ where } \delta_a^2 \text{ and } \delta_w^2 \text{ are the variances among the sample means and within}$$

samples respectively. The variances are given as:

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

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

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.