KATHMANDU UNIVERSITY
End Semester Examination
March/April, 2017

Marks Scored:

Level : B. Sc./B. Pharm.
Year : II
Course : MATH 206
Semester : I
Exam Roll No. :
Time : 30 mins.
F. M. : 20
Registration No. :
Date : MAR 2 4 2017

SECTION "A"
[10 Q. × 1 = 10 marks]

Fill in the blank(s) by the most appropriate word(s) or symbol(s).

1. The information that is usually available for _____ is the number of times that an appropriate event occurs in n observations.

2. The maximum error of estimation of the proportion is _____

3. If the random samples of size n is taken from normal populations, then the critical region for testing the null hypothesis that a population variance equals a specified constant against the alternative hypothesis $\sigma^2 > \sigma_0^2$ is _____

4. The expected cell frequency for any given cell in any contingency table may be obtained by_____

5. _____ is the connection between the observed frequency distribution with the corresponding values theoretical distribution.

6. We apply _____. for alternative test to the paired sample t-test.

7. The number of degrees of freedom for a 3 × 4 contingency table is _____

8. If a set of paired data consisting of n points (x_i, y_i) "straightens out" when $logy$ is plotted verses x_i, this indicates that the regression curve of Y on x is _____

9. In usual notation, the relationship between SST, SS(Tr), SSB and SSE in randomized block design SS(E)= _____

10. In a control chart, if a characteristic is nearly normally distributed, its natural variation is within _____ of its mean.

SECTION "B"
[10 Q. × 1 = 10 marks]

11. The confidence interval on the variances of normal population involves _____

a) χ^2 – *distribution*
b) t – *distribution*
c) F – *distribution*
d) Z – *distribution*

12. F statistics depends on the _____

a) Number of rows
b) Number of columns
c) degrees of freedom
d) level of significance

13. _____technique or method is appropriate for testing equivalence of a set of two or more populations means.
a) Analysis of variance
b) Randomization
c) Replication
d) local control

14. If there are 12 symbols of two types, equal in number, the maximum possible number of run is: _____
a) 8 b) 10 c) 11 d) 12

15. If the sample sizes n_1 and n_2 are large in Rank sum test, the variable U_1 is distributed with variance is equal to _____

a) $\frac{(n_1+n_2)(n_1+n_2+1)}{12}$

b) $\frac{(n_1-n_2)(n_1+n_2+1)}{12}$

c) $\frac{(n_1n_2)(n_1+n_2+1)}{12}$

d) $\frac{(n_1+n_2+1)}{12}$

16. If the fitted regression model is $Y = 46.4 - 8.78X_1 - 22.6X_2$ then the regression coefficient of Y *on* X_1 is _____
a) 8.78 b) -8.78 c) 22.6 d) -22.6

17. The lower control limit for the number-of-defects chart is _____

a) $\bar{p} + 3\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$

b) $\bar{p} - 3\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$

c) $\bar{c} + 3\sqrt{\bar{c}}$

d) $\bar{c} - 3\sqrt{\bar{c}}$

18. Control charts consist of _____
a) three control lines
b) upper control limits
c) the level of process
d) lower control limits

19. The range of any partial correlation coefficient is _____
a)[(-1, 1); b)$(-\infty, \infty)$; c)$(0, \infty)$; d)$(0, 1)$]

20. The correlation coefficient r_{12} is called _____
a) zero order partial correlation
b) first order partial correlation
c) second order partial correlation
d) third order partial correlation

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SECTION "C"
[3Q. × 9 = 27 marks]

1. What is multiple and partial correlation coefficients? Write down the some properties of multiple correlation coefficients. [3+6]

The following are data on the drying time of a certain varnish and the amount of an additive that is intended to reduce the drying time:.

Amount of varnish additive (grams), x	Drying time (hours), y
0	12.0
1	10.5
2	8.0
3	7.0
4	8.0
5	9.0

a) Draw a scatter plot to verify that it is reasonable to assume that the relationship is parabolic curve.
b) Fit a second degree polynomial by the method of least squares to the given data.

2. What do you understand by analysis of variance? Underline the basic and common assumptions used in analysis of variance technique. [3+6]

Layout the analysis of variance table (ANOVA) for the two way classifications of data?

OR

What do you mean by the principles of randomization, replication and local control?

A clinical study was conducted to investigate three doses of an investigational antihypertensive drug. Fifteen participants were recruited (five per group), and randomized to three treatment groups: 10 mg, 20 mg, and 30 mg. Each treatment was taken once a day. Systolic Blood Pressure (SBP) was measured 5 min before the administration of the drug (baseline) and again 30 min after. Reductions in blood pressure (mmHg) when patients take a formulation were taken for each participant. The corresponding data are presented as in the following table: [3+6]

Reductions in blood pressure (mmHg) when patients take a formulation		
10 mg treatment group	20 mg treatment group	30 mg treatment group
13	15	15
24	23	26
26	21	28
16	22	18
29	32	31

a) Write the corresponding model.
b) Check whether each component of the model has any effect on the Systolic Blood Pressure (SBP) of the patients at a significance level 5%
(Given $F_{0.05,2,12} = 3.89, F_{0.05,3,12} = 3.49 F_{0.05,2,14} = 3.74, F_{0.05,12,14} = 2.48$)

3. Describe briefly on the method of constructing control charts for fraction-defective chart, giving the formula for the upper and lower control limits in both cases.
In the production of silicon wafers, 30 lots of size 500 are sampled, and the proportion of defective wafers is calculated for each sample. Table presents the results.

Sample	Number Defective	Proportion Defective	Sample	Number Defective	Proportion Defective
1	17	0.034	11	18	0.066
2	26	0.052	12	33	0.058
3	31	0.062	13	29	0.034
4	25	0.05	14	17	0.056
5	26	0.052	15	28	0.052
6	29	0.058	16	30	0.048
7	36	0.072	17	25	0.052
8	26	0.05	18	22	0.053
9	25	0.042	19	18	0.044
10	21	0.036	20	19	0.036

Display control limits for the p chart. Plot the chart. Does the process appear to be in control?

SECTION "D"

[4Q ×7 = 28 marks]

4. The following are the numbers of misprints counted on pages selected at random from three Wednesday editions of a newspaper:

March 1: 4, 10, 2, 6, 4, 12
March 8: 8, 5, 13, 8, 8, 10
March 15: 7, 9, 11, 2, 14, 7

Use the H test at the 0.05 level of significance to test the null hypothesis that the 3 samples come from identical populations.

5. Suppose that we want to estimate the true proportion of defectives in a very large shipment of bricks and that we want to be at least 99% confident that the maximum error is at most 0.02. How large a sample we need if
a) We have no idea what the true proportion might be
b) We know that the true proportion does not exceed 0.01?

6. In a sample survey of Kathmandu University student opinion, answer the following questions. i) Do you smoke ii) Are you favor of option on sale of cigarette. Use the level of significance $\alpha = 0.05$ to decide on the basis of the sample data shown in the following table whether it is reasonable to opinion on the sale of cigarette is dependent on individual smoking?

	Questions		
	Yes	No	Total
Yes	55	30	85
No	15	10	25
Total	70	40	110

7. Write short notes on: ANY TWO of the following.
(a) Multiple Regression
(b) Rank-Sum Test
(c) Control chart.

Table. 200

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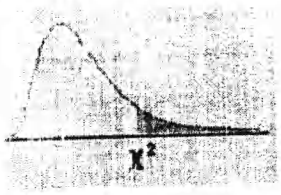
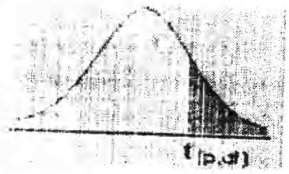


Table: Percentage point of the χ^2 distribution

v\area	0.995	0.99	0.975	0.95	0.9	0.75	0.5	0.25	0.1	0.05	0.025	0.01	0.005
1	0.00004	0.00016	0.00098	0.00393	0.01579	0.10153	0.45494	1.3233	2.70554	3.84146	5.02389	6.6349	7.8791
2	0.01003	0.0201	0.05064	0.10259	0.21072	0.57536	1.38629	2.77259	4.60517	5.99146	7.37776	9.21034	10.596
3	0.07172	0.11483	0.2158	0.35185	0.58437	1.21253	2.36597	4.10834	6.25139	7.81473	9.3484	11.34487	12.838
4	0.20699	0.29711	0.48442	0.71072	1.06362	1.92256	3.35669	5.38527	7.77944	9.48773	11.14329	13.2767	14.860
5	0.41174	0.5543	0.83121	1.14548	1.61031	2.6746	4.35146	6.62568	9.23636	11.0705	12.8325	15.08627	16.749
6	0.67573	0.87209	1.23734	1.63538	2.20413	3.4546	5.34812	7.8408	10.64464	12.59159	14.44938	16.81189	18.547
7	0.98926	1.23904	1.68987	2.16735	2.83311	4.25485	6.34581	9.03715	12.01704	14.06714	16.01276	18.47531	20.277
8	1.34441	1.6465	2.17973	2.73264	3.48954	5.07064	7.34412	10.21885	13.36157	15.50731	17.53455	20.09024	21.954
9	1.73493	2.0879	2.70039	3.32511	4.16816	5.89883	8.34283	11.38875	14.68366	16.91898	19.02277	21.66599	23.589
10	2.15586	2.55821	3.24697	3.9403	4.86518	6.7372	9.34182	12.54886	15.98718	18.30704	20.48318	23.20925	25.188
11	2.60322	3.05348	3.81575	4.57481	5.57778	7.58414	10.341	13.70069	17.27501	19.67514	21.92005	24.72497	26.75
12	3.07382	3.57057	4.40379	5.22603	6.3038	8.43842	11.34032	14.8454	18.54935	21.02607	23.33666	26.21697	28.29
13	3.56503	4.10692	5.00875	5.89186	7.0415	9.29907	12.33976	15.98391	19.81193	22.36203	24.7356	27.68825	29.81
14	4.07467	4.66043	5.62873	6.57063	7.78953	10.16531	13.33927	17.11693	21.06414	23.68479	25.11895	29.14124	31.319
15	4.60092	5.22935	6.26214	7.26094	8.54676	11.03654	14.33886	18.24509	22.30713	24.99579	27.48839	30.57791	32.801
16	5.14221	5.81221	6.90766	7.96165	9.31224	11.9122	15.3385	19.36886	23.54183	26.29623	28.84535	31.99993	34.267
17	5.69722	6.40776	7.56419	8.67176	10.08519	12.79193	16.33818	20.48868	24.76904	27.58711	30.19101	33.40866	35.718
18	6.2648	7.01491	8.23075	9.39046	10.86494	13.67529	17.3379	21.60489	25.98942	28.8693	31.52638	34.80531	37.15
19	6.84397	7.63273	8.90652	10.11701	11.65091	14.562	18.33765	22.71781	27.20357	30.14353	32.85233	36.19087	38.58
20	7.43384	8.2604	9.59078	10.85081	12.44261	15.45177	19.33743	23.82769	28.41198	31.41043	34.16961	37.56623	39.99
21	8.03365	8.8972	10.2829	11.59131	13.2396	16.34438	20.33723	24.93478	29.61509	32.67057	35.47888	38.93217	41.4
22	8.64272	9.54249	10.98232	12.33801	14.04149	17.23962	21.33704	26.03927	30.81328	33.92444	36.78071	40.28936	42.7
23	9.26042	10.19572	11.68855	13.09051	14.84796	18.1373	22.33688	27.14134	32.00689	35.17246	38.07563	41.6384	44.1
24	9.88623	10.85636	12.40115	13.84843	15.65868	19.03725	23.33673	28.24115	33.19624	36.41503	39.36408	42.97982	45.55
25	10.51965	11.52398	13.11972	14.61141	16.47341	19.93934	24.33659	29.33885	34.38159	37.65248	40.64647	44.3141	46.92
26	11.16024	12.19815	13.8439	15.37916	17.29188	20.84343	25.33646	30.43457	35.56317	38.88514	41.92317	45.64168	48.29
27	11.80759	12.8785	14.57338	16.1514	18.1139	21.7494	26.33634	31.52841	36.74122	40.11327	43.19451	46.96294	49.64
28	12.46134	13.56471	15.30786	16.92788	18.93924	22.65716	27.33623	32.62049	37.91592	41.33714	44.46079	48.27824	50.99
29	13.12115	14.25645	16.04707	17.70837	19.76774	23.56659	28.33613	33.71091	39.08747	42.55697	45.72229	49.58788	52.33
30	13.78672	14.95346	16.79077	18.49266	20.59923	24.47761	29.33603	34.79974	40.25602	43.77297	46.97924	50.89218	53.67

Table: Percentage point of the t distribution



ν \ α	0.4	0.25	0.1	0.05	0.025	0.01	0.005	0.0005
1	0.32492	1	3.077684	6.313752	12.7062	31.82052	63.65674	636.6192
2	0.288675	0.816497	1.885618	2.919986	4.30265	6.96456	9.92484	31.5991
3	0.276671	0.764892	1.637744	2.353363	3.18245	4.5407	5.84091	12.924
4	0.270722	0.740697	1.533206	2.131847	2.77645	3.74695	4.60409	8.6103
5	0.267181	0.726687	1.475884	2.015048	2.57058	3.36493	4.03214	6.8688
6	0.264835	0.717558	1.439756	1.94318	2.44691	3.14267	3.70743	5.9588
7	0.263167	0.711142	1.414924	1.894579	2.36462	2.99795	3.49948	5.4079
8	0.261921	0.706387	1.396815	1.859548	2.306	2.89646	3.35539	5.0413
9	0.260955	0.702722	1.383029	1.833113	2.26216	2.82144	3.24984	4.7809
10	0.260185	0.699812	1.372184	1.812461	2.22814	2.76377	3.16927	4.5869
11	0.259556	0.697445	1.36343	1.795885	2.20099	2.71808	3.10581	4.437
12	0.259033	0.695483	1.356217	1.782288	2.17881	2.681	3.05454	4.3178
13	0.258591	0.693829	1.350171	1.770933	2.16037	2.65031	3.01228	4.2208
14	0.258213	0.692417	1.34503	1.76131	2.14479	2.62449	2.97684	4.1405
15	0.257885	0.691197	1.340606	1.75305	2.13145	2.60248	2.94671	4.0728
16	0.257599	0.690132	1.336757	1.745884	2.11991	2.58349	2.92078	4.015
17	0.257347	0.689195	1.333379	1.739607	2.10982	2.56693	2.89823	3.9651
18	0.257123	0.688364	1.330391	1.734064	2.10092	2.55238	2.87844	3.9216
19	0.256923	0.687621	1.327728	1.729133	2.09302	2.53948	2.86093	3.8834
20	0.256743	0.686954	1.325341	1.724718	2.08596	2.52798	2.84534	3.8495
21	0.25658	0.686352	1.323188	1.720743	2.07961	2.51765	2.83136	3.8193
22	0.256432	0.685805	1.321237	1.717144	2.07387	2.50832	2.81876	3.7921
23	0.256297	0.685306	1.31946	1.713872	2.06866	2.49987	2.80734	3.7676
24	0.256173	0.68485	1.317836	1.710882	2.0639	2.49216	2.79694	3.7454
25	0.25606	0.68443	1.316345	1.708141	2.05954	2.48511	2.78744	3.7251
26	0.255955	0.684043	1.314972	1.705618	2.05553	2.47863	2.77871	3.7066
27	0.255858	0.683685	1.313703	1.703288	2.05183	2.47266	2.77068	3.6896
28	0.255768	0.683353	1.312527	1.701131	2.04841	2.46714	2.76326	3.6739
29	0.255684	0.683044	1.311434	1.699127	2.04523	2.46202	2.75639	3.6594
30	0.255605	0.682756	1.310415	1.697261	2.04227	2.45726	2.75	3.646
inf	0.253347	0.67449	1.281552	1.644854	1.95996	2.32635	2.57583	3.2905