F. Y. B Pha
Final
16|04|25
Sem - VIII.

Time: (3 Hr)   **Max. Marks: - 75**

Note: - 1) Marks to the right indicate full marks
         2) Use of scientific calculators are allowed

Q1   Choose appropriate option   20
     1.   What is range for the data 4,5,6,6,7,8,9?
     a   3
     b   4
     c   5
     d   6

     2.   Dispersion of data is **NOT** given by ---
     a   Mean
     b   Standard deviation
     c   Variance
     d   Standard error of mean

     3   For Normally distributed data of tablet weight the mean content and standard
            deviation of drug is observed to be 100 ± 5 mg. What percent of tablets will
            have weight below 100 mg
     a   40
     b   50
     c   65
     d   95

     4   If probability of good tablets in a batch is 0.95 what is the probability of getting
            two tablets defective?
     a   0.9025
     b   0.095
     c   0.05
     d   0.025

     5   Recording of pain score from 0 to 4, with 0 for no pain and 4 for severe pain
            indicates ----- type of data
     a   Continuous
     b   Dichotomus
     c   Binomial
     d   Ordinal

     6   Rejection of null hypothesis when it is true is ---
     a   Type I error
     b   Type II error
     c   Power of test
     d   Probability of type I error

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7 If probability of type II error is 0.25 what is the power of study
a 0.75
b 0.5
c 0.25
d 0.125

8 The numbers of Science , arts and commerce graduates working in a company are 30, 70 50 respectively. What is the angle corresponding to commerce graduates in pie chart?
a 36
b 72
c 119
d 168

9 The value of coefficient of correlation lies between __
a 0 and 1
b -1 and 1
c 0 and -1
d $-\infty$ and $+\infty$

10 If the critical t value is 2.18 at α = 0.05 and the calculated t value is -3.5 which of the following conclusions is appropriate
a Means of two groups are not significantly different
b Means of two groups are significantly different
c Medians of two groups are not significantly different
d Medians of two groups are significantly different

11 Which of the following is an example of a cohort study?
a A study in which individuals with a particular disease are compared to individuals without the disease
b A study in which individuals are randomly assigned to receive a particular treatment or placebo
c A study in which individuals who were exposed to a particular substance are followed over time to determine the incidence of disease
d A study in which individuals are surveyed about their dietary habits and the number of individuals suffering from a disorder at that time is reported.

12 Factorial designs allow us to study both _____ effects of the independent variables on the dependent variables.
a main and interactive
b dependent and independent
c symbiotic and dichotomous
d rank order and correlational

13 What are the points in a Central Composite Design that are located at a distance from the center of the design space, beyond the factorial points?
a Factorial Points
b Center Points
c Axial Points
d Replicated Points

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14 In case of analysis of vitamin C content of four varieties of amala fruits , 10 amala fruits from each variety were taken. In this situation what is the degrees of freedoms to be referred to performing one way ANOVA?
a   Df1 = 4, df2 = 40
b   Df1= 4, df2=36
c   Df1= 3, df2= 40
d   Df1 = 3, df2= 36

15 Number of experiments to be performed for four factors and two levels
a   8
b   16
c   4
d   32

16 In an experiment positive negative values are equally likely to occur. The probability of obtaining at most one negative value in five trials is
a   1/32
b   2/32
c   3/32
d   5/32

17 To test hypothesis that newly invented drug is capable of reducing elevated blood pressure, for 10 volunteers initial blood pressure was recorded for each volunteer and blood pressure was again measured after administration of the drug. If the data follows normal distribution which one of the following tests is applicable?
c   One tail Unpaired t test
b   One tail paired t test
c   Two tails paired t test
d   Two tails unpaired t test

18 Which one of the following softwares requires writing of script?
a   SPSS
b   Excel
c   Minitab
d   R online

19 If the two means are 4.5 and 6.5 and least significant difference is 1.5 which one of the following statements is true?
a   The two means are not significantly different
b   The two means are significantly different
c   There is no connection of least significant difference with the means
d   We can not predict the significant difference between the means

20 If 2 % of articles produced in a factory are defective what is the mean of Poisson distribution for n=50
a   0.001
b   0.01
c   0.1
d   1

Q2   Answer any two   20

A i   Cleaning action of four detergents were studied by washing pieces of white   7
cloth soaked in Indian ink. The whiteness readings of the clothes after washing
are given below. Assume that the data is normally distributed, apply suitable
statistical test and state if there is difference in the whiteness readings for the
detergents

A	B	C	D
77	74	73	76
81	66	78	85
61	58	57	77

    ii   Enlist four different ways for graphical presentation and explain any one   3

B i   Scores of students in biostatistics are as follows. Construct cumulative   7
frequency distribution curve and calculate median and mean

Marks Range	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60
Frequency	5	8	12	7	10	8

    ii   Calculate mean, mode, median and standard deviation for the following   3
12, 8, 5, 9, 10, 13, 5, 8, 5

C i   Consider the example below where the mass, y (grams), of a chemical is   7
related to the time, x (seconds), for which the chemical reaction has been
taking place according to the table:
Find equation of regression line and coefficient of correlation.

Time, x (seconds) 5 7   12 16 20

Mass, y (grams)   40 120 180 210 240

    ii   What is plagiarism? Describe methods for detection of the same   3

Q3   Answer any seven   35

    i   Define factorial design? Give one advantage of factorial design. Discuss the   5
number and Design of experiments for 3 factors 2 levels factorial design

    ii   A random sample of 10 students who attended the workshop (Group A) and   5
another random sample of 8 students who did not (Group B) were given the
same test. The average test score for Group A was 78 with a standard deviation
of 8, while Group B had an average score of 72 with a standard deviation of
9. Apply suitable statistical test assuming that the data is normally distributed
and state if there is difference in the average test score.

    iii Differentiate between observational and experimental studies and write a note   5
on observational studies.

    iv   A student investigated whether there were more trichomes (stings) on nettles
that were grazed compared with nettles that were ungrazed. The number of
trichomes per cm^2 are given below. Apply Mann Whitney test and state if there
is difference in the number of trichomes Ucrit = 10

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Plants	Number of Trichomes / cm^2 in each sample							
Grazed	12	14	15	17	19	22	23	26
Ungrazed	10	13	14	16	20	21	14	

v   What is response surface methodology? Give two advantages of DOE. Write   5
     a note on central composite design.

vi   Heights of adult females are normally distributed with mean of 160cm with   5
     standard deviation of 8 cm
     a) What percentage of females will have height between 160 to 170 cm?
     b) What percentage of female will have height below 150 cm ?

vii Give various components of scientific report writing. Write a note on case   5
     control study.

viii In the manufacture of glassware, bubbles can occur in the glass which reduces   5
     the status of the glassware to that of a 'second'. If, on average, one in every
     1000 items produced has a bubble, calculate the probability that exactly
     6 items in a batch of 3000 are seconds.

ix   A small survey of 15 young people who report sleeping either more than
     8 hours, 6–8 hours or less than 6 hours per night on average. They then
     measure their mental wellbeing using a validated score. Table 1 shows the raw
     wellbeing scores collected across the sleeping categories along with the
     median wellbeing score in each category.

Hours of sleep per night	Wellbeing score values				
>8 hours	42	34	57	69	55
6-8 hours	29	66	46	68	42
<6 hours	16	32	35	66	59

Apply Kruskal Wallis test and state if there difference in the well being scores
Hcritical value = 5.991

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Cumulativa Probability
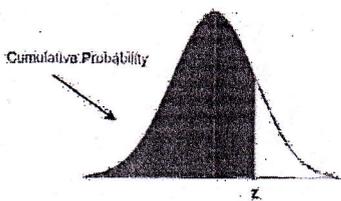
STANDARD NORMAL DISTRIBUTION: Table Values Represent AREA to the LEFT of the Z score.

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.50000	.50399	.50798	.51197	.51595	.51994	.52392	.52790	.53188	.53586
0.1	.53983	.54380	.54776	.55172	.55567	.55962	.56356	.56749	.57142	.57535
0.2	.57926	.58317	.58706	.59095	.59483	.59871	.60257	.60642	.61026	.61409
0.3	.61791	.62172	.62552	.62930	.63307	.63683	.64058	.64431	.64803	.65173
0.4	.65542	.65910	.66276	.66640	.67003	.67364	.67724	.68082	.68439	.68793
0.5	.69146	.69497	.69847	.70194	.70540	.70884	.71226	.71566	.71904	.72240
0.6	.72575	.72907	.73237	.73565	.73891	.74215	.74537	.74857	.75175	.75490
0.7	.75804	.76115	.76424	.76730	.77035	.77337	.77637	.77935	.78230	.78524
0.8	.78814	.79103	.79389	.79673	.79955	.80234	.80511	.80785	.81057	.81327
0.9	.81594	.81859	.82121	.82381	.82639	.82894	.83147	.83398	.83646	.83891
1.0	.84134	.84375	.84614	.84849	.85083	.85314	.85543	.85769	.85993	.86214
1.1	.86433	.86650	.86864	.87076	.87286	.87493	.87698	.87900	.88100	.88298
1.2	.88493	.88686	.88877	.89065	.89251	.89435	.89617	.89796	.89973	.90147
1.3	.90320	.90490	.90658	.90824	.90988	.91149	.91309	.91466	.91621	.91774
1.4	.91924	.92073	.92220	.92364	.92507	.92647	.92785	.92922	.93056	.93189
-1.9	.02872	.02807	.02743	.02680	.02619	.02559	.02500	.02442	.02385	.02330
-1.8	.03593	.03515	.03438	.03362	.03288	.03216	.03144	.03074	.03005	.02938
-1.7	.04457	.04363	.04272	.04182	.04093	.04006	.03920	.03836	.03754	.03673
-1.6	.05480	.05370	.05262	.05155	.05050	.04947	.04846	.04746	.04648	.04551
-1.5	.06681	.06552	.06426	.06301	.06178	.06057	.05938	.05821	.05705	.05592
-1.4	.08076	.07927	.07780	.07636	.07493	.07353	.07215	.07078	.06944	.06811
-1.3	.09680	.09510	.09342	.09176	.09012	.08851	.08691	.08534	.08379	.08226
-1.2	.11507	.11314	.11123	.10935	.10749	.10565	.10383	.10204	.10027	.09853
-1.1	.13567	.13350	.13136	.12924	.12714	.12507	.12302	.12100	.11900	.11702
-1.0	.15866	.15625	.15386	.15151	.14917	.14686	.14457	.14231	.14007	.13786

t-test table

cum. prob	$t_{.50}$	$t_{.75}$	$t_{.80}$	$t_{.85}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.90}$	$t_{.995}$	$t_{.999}$	$t_{.9995}$
one-tail	0.50	0.25	0.20	0.15	0.10	0.05	0.025	0.01	0.005	0.001	0.0005
two-tails	1.00	0.50	0.40	0.30	0.20	0.10	0.05	0.02	0.01	0.002	0.001
df											
1	0.000	1.000	1.376	1.963	3.078	6.314	12.71	31.82	63.66	318.31	636.62
2	0.000	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	0.000	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	0.000	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	0.000	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	0.000	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	0.000	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	0.000	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	0.000	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	0.000	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	0.000	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	0.000	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	0.000	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	0.000	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	0.000	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	0.000	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	0.000	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	0.000	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	0.000	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	0.000	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.552	3.850

F-table of Critical Values of α = 0.05 for F(df1, df2)

DF1=1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	∞
DF2=1 161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.54	241.88	243.91	245.95	248.01	249.05	250.10	251.14	252.20	253.25	254.31
2 18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.49	19.50
3 10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53
4 7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63
5 6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.37
6 5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.67
7 5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23
8 5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93
9 5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71
10 4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54

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F-table of Critical Values of α = 0.05 for F(df1, df2)