Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, Dec 2021

Course: Research Methodology and Biostatistics
Program: M.Sc.-Microbiology/N &D
Course Code: HSCC7005

Semester: I
Time: 03 hrs
Max. Marks: 100

Instructions: Read question carefully.
Use of calculator is permitted

SECTION A

S. No.	MCQ's /Fill in the blanks/ T&F (1.5 marks each)	**30 Marks**	**CO**
1	Survey helps to understand population. a. True b. False	**1.5**	**CO1**
2	Opinion polls are the examples of survey methods. a. True b. False	**1.5**	**CO1**
3	Which one of the following is an indication of the quality of a research journal? a. H-index b. I10-index c. G-index d. Impact factor	**1.5**	**CO1**
4	Good 'research ethics' means: a. Not disclosing the holdings of shares/stocks in a company that sponsors your research b. Assigning a particular research problem to one research student only c. Discussing with your colleagues confidential data from a research paper that you are reviewing for an academic journal d. Submitting the same research manuscript for publishing in more than one journal	**1.5**	**CO1**
5	The H-index was introduced by _____ in the year 2005.	**1.5**	**CO1**
6	Which one is not a non-experimental research a. field study b. field experiment c. case study d. survey	**1.5**	**CO1**
7	The arithmetic mean of a set of 10 numbers is 20. If each number is first multiplied by 2 and then increased by 5, then what is the mean of new numbers? a. 20 b. 25 c. 40 d. 45	**1.5**	**CO1**
8	When r = 1, there is perfect a. None b. perfect -ve relationship between the variables c. perfect +ve relationship between the variables d. D. no relationship between the variables	**1.5**	**CO1**

9	For a data set the regression equation is Y = 21 - 3X. The correlation coefficient for this data a. must be 0 b. is negative c. must be 1 d. is positive	**1.5**	**CO1**
10	For a given data with 50 observations the 'less than ogive' and the 'more than ogive' intersect at (15.5, 20). The median of the data is a. 4.5 b. 20 c. 50 d. 15.5	**1.5**	**CO2**
11	A national random sample of 20 ACT scores from 2010 is listed below. Calculate the sample mean and standard deviation. 29, 26, 13, 23, 23, 25, 17, 22, 17, 19, 12, 26, 30, 30, 18, 14, 12, 26, 17, 18 a. 20.50, 5.79 b. 20.50, 5.94 c. 20.85, 5.79 d. 20.85, 5.94	**1.5**	**CO2**
12	In a one-tail test for the population mean, if the null hypothesis is not rejected when the alternative hypothesis is true then: a. a Type I error is committed. b. a Type II error is committed. c. a one-tail test should be used instead of a two-tail test. d. a two-tail test should be used instead of a one-tail test.	**1.5**	**CO2**
13	Type I error is defined as a. rejecting a null hypothesis when it is in fact true b. failing to reject a false null hypothesis c. rejecting a false null hypothesis d. failing to reject a true null hypothesis	**1.5**	**CO3**
14	Which of the following statement is "False" a. Parametric test is applicable only for Variable b. Non Parametric test is applicable for Variable as well as Attribute c. Parametric test is applicable for Nominal Scale data d. Non Parametric test is applicable for Nominal Scale data	**1.5**	**CO3**
15	Previously, an organization reported that teenagers spent 4.5 hours per week, on average, on the phone. The organization thinks that, currently, the mean is higher. Fifteen randomly chosen teenagers were asked how many hours per week they spend on the phone. The sample mean was 4.75 hours with a sample standard deviation of 2.0. Conduct a hypothesis test. The null and alternative hypotheses are: a. H_o: μ= 4.5, H_a : μ > 4.5 b. H_o: $\mu \geq 4.5$, H_a: $\mu < 4.5$ c. H_o: $\mu = 4.75$, H_a: $\mu > 4.75$ d. H_o: $\mu = 4.5$, H_a: $\mu > 4.5$	**1.5**	**CO4**
16	The shape of the normal curve depends on its _____ a. Mean deviation b. Standard deviation c. Quartile deviation d. Correlation	**1.5**	**CO4**
17	We want to test if it takes fewer than 45 minutes to teach a lesson plan. State the null and alternative hypotheses. Fill in the correct symbol (=, ≠, ≥, <, ≤, >) for the null and alternative hypotheses. H_0: μ __ 45 H_a: μ __ 45	**1.5**	**CO3**

18	The mean wage of 150 laborers working in a factory running three shifts with 60, 40 and 50 laborers is Rs. 114. The mean wage of 60 laborers in the first shift is Rs.. 121.50 and that of 40 laborers working the second shift is Rs. 107.75, then the mean wage of those working in the third shift is: a. Rs. 100 b. Rs. 110 c. Rs. 115.75 d. Rs. 120	**1.5**	**CO3**
19	Approximately what percentage of scores falls within +1 standard deviation and +3 standard deviation in the standard normal distribution curve? a. 23% b. 36% c. 99.5% d. 84% e. None of the above	**1.5**	**CO2**
20	Which of the following is a non-parametric test? a. F-test b. Z-test c. Wilcoxon test d. All of the above	**1.5**	**CO4**
	SECTION B (5 marks each question)		
Q	Short Answer Type Question (5 marks each) Answer any FOUR questions. Word limit (100-120)	**20 Marks**	**CO**
1	Discuss the meaning and importance of research.	**5**	**CO5**
2	Discuss the different types of research?	**5**	**CO5**
3	What is NULL hypothesis? How it is differ from Alternative hypothesis? Give example to explain your answer. (1+2+2) Or Current research indicates that the distribution of the life expectancies of a certain protozoan is normal with a mean of 43 days and a standard deviation of 10.5 days. Find the probability that a simple random sample of 64 protozoa will have a mean life expectancy of 46 or more days.	**5**	**CO4**
4	a)At an influenza immunization clinic at a retirement community, residents were asked in how many previous years they had received influenza vaccine. The answers from the first 19 residents are listed below. Organize these data into a frequency distribution. 2, 0, 3, 1, 0, 1, 2, 2, 4, 8, 1, 3, 3, 12, 1, 6, 2, 5, 1 b) A coin is thrown 3 times .what is the probability that atleast one head is obtained?	**5 (3+2)**	**CO2**
5	Write the short notes on any two a) Binomial Distribution b) Double Sampling c) Scatter Plot	**5**	**CO3**

SECTION C 30 marks

Q	Two case studies 15 marks each subsections	30 Marks	CO
1	The study was carried out in river kosi, Rampur district, India to assess the physicochemical parameter of river water. For that, six sites are select to collect samples where industrial & domestic waste is regularly mixing in river kosi and by these activities river water become polluted. The samples were analyzed to measure the DO, BOD, COD, TS and alkalinity. The collected data were shown in table given below. Based on the data given, write the answer of the following question. a) Using suitable scale plot the scatter Plot between COD and DO and explain the trend. b) Calculate the Karl Pearson correlation coefficient between Alkalinity and B.O.D and using the result explain the strength of relationship between these two. c) Using the base data of DO(X) & TS(Y) Calculate regression coefficient Byx & Bxy hence write the regression equation y on x .	**15 (5+5+5)**	**CO1**
2	Heart rates depend on many factors. However, resting heart rates between 60 and 100 beats per minute are considered normal for anyone over 10 years old. Suppose that for this age group, resting heart rates are approximately normally distributed with a mean of 78 and a standard deviation of 12. a) What proportion of people over 10 years old will have resting heart rates between 60 and 100? b) What is the 95th percentile for the resting heart rates of people over 10 years old? c) If resting heart rate will be more than 110 will be consider as unusual then find the % of person whose heart rate is unusual?	**15 (6+2+7)**	**CO2**

Table-1: Average value (mg/lit) of physicochemical parameters of Kosi river

Site	Alkalinity	B.O.D.	C.O.D.	D.O.	T.S.
S 1	157	5.6	33.6	6.8	810
S 2	130	5	27.1	7.2	399
S 3	152	5.2	33.3	6.9	618
S 4	150	5.5	32.8	7	405
S 5	159	5.7	34	6.6	834
S 6	162	5.8	36.5	6.4	935

SECTION- D 20 marks

Q	Long Answer type Questions (10 marks each) Word limit 200-250	**20 Marks**	**CO**
1	What is the difference between Parametric and Non-parametric tests for comparing two or more groups? Explain with example?	**10 (7+3)**	CO5
2	What is scientific method of research? What are the characteristics of scientific method?	**10 (4+6)**	**CO5**

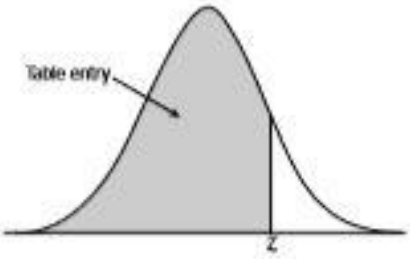
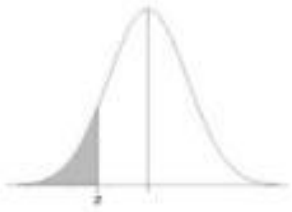


Table entry for z is the area under the standard normal curve to the left of z.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

Standard Normal Cumulative Probability Table



Cumulative probabilities for NEGATIVE z-values are shown in the following table:

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
-3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
-3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
-3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641