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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS- 2021

B. Tech. III Semester (BT)

COURSE CODE: 18B11MA312

MAX. MARKS: 35

COURSE NAME: PROBABILITY AND STATISTICAL TECHNIQUES

COURSE CREDITS: 04

MAX. TIME: 2 Hours

*Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. Use of scientific calculator is allowed. Statistical tables are given for critical values.*

1. A drug manufacturer has installed a machine which automatically fills 5 gm of drug in each phial. A random sample of 10 phials was taken and it was found to contain 5.02 gm on an average in a phial. The standard deviation of the sample was 0.002 gm. Test at 5% level of significance if the adjustment in the machine is in order. (3 marks)[CO-3]
2. A plant has installed two machine producing polythene bags. During the installation, the manufacturer of the machine has started that the capacity of the machine is to produce 20 bags in a day. Owing to various factors such as different operators working on these machines, raw material, etc., there is a variation in the number of bags produced at the end of the day. The company researcher has taken a random sample of bags produced in 10 days for machine 1 and 13 days for machine 2, respectively. The following data gives the number of units of an item produced on a sampled day by two machines:

Machine 1	20	16	26	27	23	22	18	24	25	19		
Machine 2	27	33	42	35	32	34	38	28	41	43	30	37

How can the researcher determine whether the variance is from the same population (population variance are equal) or it comes from different populations (population variance are not equal)? Use 5% level of significance. (5 marks)[CO-3]

3. In an experiment on COVID immunization, the following results were obtained:

	Affected	Unaffected
Inoculated	12	28
Not Inoculated	13	7

Examine the effect of vaccine in controlling the incidence of the disease.

(5 marks)[CO-3]

4. An ambulance service claims that it takes, on the average 8.9 minutes to reach its destination in emergency calls. To check on this claim, the agency which licenses ambulance services has then timed on 50 emergency calls, getting a mean of 9.3 minutes with a standard deviation of 1.8 minutes. Does this constitute evidence that the figure claimed is too low at the 1% significance level? **(3 marks)[CO-3]**
5. Two ladies X and Y were asked to rank 7 different types of lipsticks. The ranks given by them are given below:

Lipsticks	A	B	C	D	E	F	G
X	2	1	4	3	5	7	6
Y	1	3	2	4	5	6	7

Calculate spearman's rank correlation coefficient.

**(4 marks)[CO-4]**

6. The following table gives age(x) in years of cars and annual maintenance cost(y) in hundred rupees:

X	1	3	5	7	9
Y	15	18	21	23	22

Estimate the maintenance cost for a 4 year old car after finding the regression equation.

**(5 marks)[CO-3]**

7. It is desired to compare three hospitals with regards to the number of deaths per quarter. A sample of death records were selected from the records of each hospital and the number of deaths was as given below. From these data, suggest a difference in the number of deaths per quarter among three hospitals, using ANOVA.

Hospital I	Hospital II	Hospital III
8	7	12
10	5	9
7	10	13
14	9	12
11	9	15

**(6 marks)[CO-5]**

8. The average height of soldiers of a country is given as 68.22 inches with variance 10.8 sq. inch. How many soldiers out of 1000 would you expect to be over 72 inches tall?

**(4 marks)[CO-2]**

Statistical tables:

t Table

cum. prob one-tail two-tails	$t_{.50}$	$t_{.75}$	$t_{.80}$	$t_{.85}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.99}$	$t_{.995}$	$t_{.998}$	$t_{.999}$
	1.00	0.50	0.40	0.30	0.20	0.10	0.05	0.025	0.01	0.005	0.001
df											
1	0.000	1.000	1.376	1.963	3.078	6.314	12.71	31.82	63.69	318.31	936.62
2	0.000	0.816	1.061	1.385	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	0.000	0.766	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	0.908	1.134	1.440	1.943	2.447	3.143	3.707	5.209	5.959
7	0.000	0.711	0.898	1.118	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	0.000	0.706	0.893	1.108	1.397	1.860	2.308	2.936	3.355	4.501	5.041
9	0.000	0.703	0.893	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	4.687

F Distribution: Critical Values of F (5% significance level)

$v_1$	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20
1	161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.54	241.88	243.91	245.36	246.46	247.32	248.01
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.42	19.43	19.44	19.45
3	10.13	9.58	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.71	8.69	8.67	8.66
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.87	5.84	5.82	5.80
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.64	4.60	4.58	4.56
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.96	3.92	3.90	3.87
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.53	3.49	3.47	3.44
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.24	3.20	3.17	3.15
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.03	2.99	2.96	2.94
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.86	2.83	2.80	2.77
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.74	2.70	2.67	2.65
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.64	2.60	2.57	2.54

Chi-square Distribution Table

d.f.	.995	.99	.975	.95	.9	.1	.05	.025	.01
1	0.00	0.00	0.00	0.00	0.02	2.71	3.84	5.02	6.63
2	0.01	0.02	0.05	0.10	0.21	4.61	5.99	7.38	9.21
3	0.07	0.11	0.22	0.35	0.58	6.25	7.81	9.35	11.34
4	0.21	0.30	0.48	0.71	1.06	7.78	9.49	11.14	13.28
5	0.41	0.55	0.83	1.15	1.61	9.24	11.07	12.83	15.09

Probability

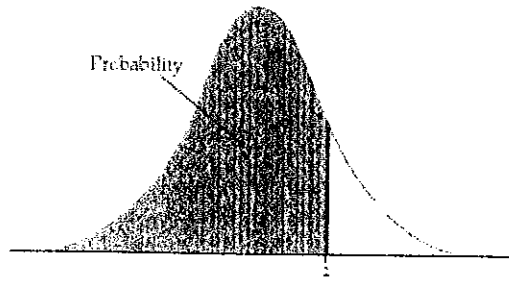


Table entry for  $z$  is the area under the standard normal curve to the left of  $z$ .

TABLE 7 Standard normal probabilities (continued)										
$z$	.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	.6442	.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	.8463	.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