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TEST-3 Examination - December 2017

Course Title: Probability and Statistics
Course Code: 10B11MA311
Semester: III

Program: B.Tech (BI/BT)
Marks: 35 marks
Time: 2 hours

Instructions: ALL questions are compulsory and carry equal marks. Statistical tables are supplied.

1. The combined percentages of carbon monoxide (CO) and ozone (O3) emissions from different sources are listed in the following table.

Transportation (T)	Industrial process (I)	Fuel combustion (F)	Solid waste (S)	Miscellaneous (M)
63%	10%	14%	5%	8%

Construct a pie chart and interpret the data.

2. Wool fibre breaking strengths are normally distributed with mean $\mu = 23.56$ Newtons and $\sigma = 4.55$. What proportion of fibres would have a breaking strength of 14.45 or less?

3. An educator believes that new directed reading activities in the classroom will help elementary school pupils improve some aspects of their reading ability. She arranges for a third-grade class of 21 students to take part in these activities for an eight-week period. A control classroom of 23 third-graders follows the same curriculum without the activities. At the end of the eight weeks, all students are given a Degree of Reading Power (DRP) test, which measures the aspects of reading ability that the treatment is designed to improve. Assume that $t_{0.01} = 2.31$.

Group	n	$\bar{x}$	s
Treatment	21	51.48	11.01
Control	23	41.52	17.15

Can you conclude that treatment (Group 1) is better than the control (Group 2) at $\alpha = 0.01$?

4. In a period of 100 minutes there were a total of 190 arrivals at a highway toll booth. The accompanying table shows the frequency of arrivals per minute over this period.

Number of arrivals	0	1	2	3	4 or more
Observed frequency	10	26	35	24	5

Test the null hypothesis that the population distribution is Poisson.

5. Find the value of Karl Pearson's correlation coefficient for the following set of data obtained by reading seven torque values (x) from an electric motor using current (y):

Experiment	1	2	3	4	5	6	7
x-value	16	14	12	10	8	6	4
y-value	12	8	16	14	4	10	6

6. Five applicants for a job are rated by two officers, with the following results:

Applicant	A	B	C	D	E
Rater 1	4	1	3	2	5
Rater 2	3	2	5	1	4

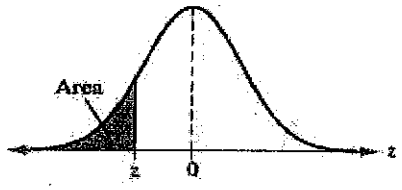
Determine the Spearman' rank correlation coefficient. Interpret your finding.

7. In order to study the effect of automobile size on the noise pollution, the following data are randomly chosen from the air pollution data. The automobiles are categorized as small, medium, large, and noise level reading (decibels) are given in table below.

Size of automobile		
Small	Medium	Large
820	840	785
820	825	775
825	815	770
835	855	760
825	840	770

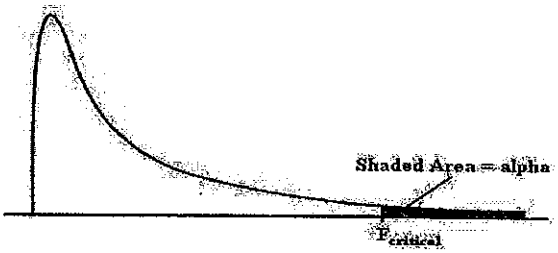
At the $\alpha = 0.05$ level of significance, employ one-way ANOVA to test for equality of population mean noise levels for different sizes of the automobiles.

Standard Normal Distribution:



z	.09	.08	.07	.06	.05	.04	.03	.02	.01	.00
−3.4	.0002	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003
−3.3	.0003	.0004	.0004	.0004	.0004	.0004	.0005	.0005	.0005	.0005
−3.2	.0005	.0005	.0005	.0006	.0006	.0006	.0006	.0006	.0007	.0007
−3.1	.0007	.0007	.0008	.0008	.0008	.0008	.0009	.0009	.0009	.0010
−3.0	.0010	.0010	.0011	.0011	.0011	.0012	.0012	.0013	.0013	.0013
−2.9	.0014	.0014	.0015	.0015	.0016	.0016	.0017	.0018	.0018	.0019
−2.8	.0019	.0020	.0021	.0021	.0022	.0023	.0023	.0024	.0025	.0026
−2.7	.0026	.0027	.0028	.0029	.0030	.0031	.0032	.0033	.0034	.0035
−2.6	.0036	.0037	.0038	.0039	.0040	.0041	.0043	.0044	.0045	.0047
−2.5	.0048	.0049	.0051	.0052	.0054	.0055	.0057	.0059	.0060	.0062
−2.4	.0064	.0066	.0068	.0069	.0071	.0073	.0075	.0078	.0080	.0082
−2.3	.0084	.0087	.0089	.0091	.0094	.0096	.0099	.0102	.0104	.0107
−2.2	.0110	.0113	.0116	.0119	.0122	.0125	.0129	.0132	.0136	.0139
−2.1	.0143	.0146	.0150	.0154	.0158	.0162	.0166	.0170	.0174	.0179
−2.0	.0183	.0188	.0192	.0197	.0202	.0207	.0212	.0217	.0222	.0228

F-Distribution:



$d.f._D$: Degrees of freedom, denominator	$\alpha = 0.05$												
	$d.f._N$: Degrees of freedom, numerator												
	1	2	3	4	5	6	7	8	9	10	12	15	20
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9	243.9	245.9	248.0
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
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
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	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
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
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
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
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
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
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.72	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	2.62	2.54
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.53	2.46
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.46	2.39
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.40	2.33