

COURSE CODE (CREDITS): 18B11MA411 (3)

MAX. MARKS: 35

COURSE NAME: BIostatistics

COURSE INSTRUCTORS: SST

MAX. TIME: 2 Hours

Note: All questions are compulsory. Marks are indicated against each question in square brackets. Use of scientific calculator is allowed.

Q.1. Compute and interpret the correlation coefficient for the following data whether there is a relationship between the time, in minutes, it takes a secretary to complete a certain form in the morning and in the late afternoon:

Morning, x	8.2	9.6	7.0	9.4	10.9	7.1	9.0	6.6	8.4	10.5
Afternoon, y	8.7	9.6	6.9	8.5	11.3	7.6	9.2	6.3	8.4	12.3

(CO-1)[4M]

Q.2. Tom is planning to pick up a friend at the airport. He has figured out that the plane is late 80% of the time when it rains, but only 30% of the time when it does not rain. If the weather forecast that morning calls for a 40% chance of rain, what is the probability that the plane will be late?

(CO-2)[3M]

Q.3. Messages arrive at a switchboard in a Poisson manner at an average rate of six per hour. Find the probability for each of the following events:

- (a) Exactly two messages arrive within one hour.
- (b) No message arrives within one hour.
- (c) At least three messages arrive within one hour.

(CO-2)[3M]

Q.4. Is there reason to believe that the life expected in south and north India is same or not from the following data.

South	34.0	39.2	46.1	48.7	49.4	45.9	55.3	42.7	43.7		
North	49.7	55.4	57.0	54.2	50.4	44.2	53.4	57.5	61.9	56.6	58.2

(CO-3)[5M]

Q.5. Use the data shown in the following table to test at the 0.01 level of significance whether a person's ability in mathematics is independent of his or her interest in statistics.

		Interest in Mathematics		
		Low	Average	High
Interest in Statistics	Low	63	42	15
	Average	58	61	31
	High	14	47	29

(CO-3)[5M]

Q.6. The following data represent the operating times in hours for three types of hedge trimmer before a recharge is required:

Hedge Trimmer																	
I					II					III							
5.0	6.2	4.5	3.9	5.0	5.3	4.8	5.9	5.8	5.5	5.2	4.8	5.4	5.8	5.6	6.1	6.3	6.6

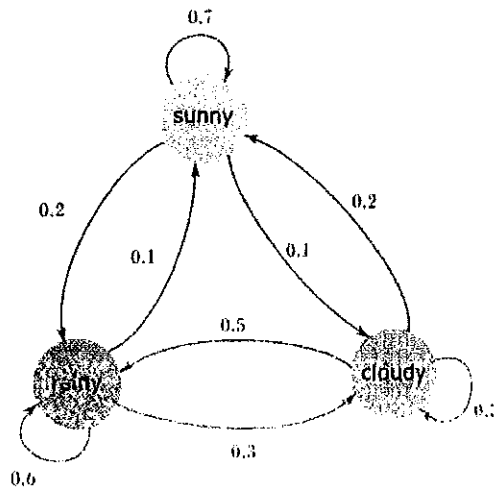
Use the Kruskal-Wallis's test, at the 0.01 level of significance, to test the hypothesis that the operating times for all three trimmers are equal. (CO-4)[5M]

Q.7. Consider the stochastic process $\{X(t)\} = 25\cos(2t + \theta)$, where θ a uniform random variable is in the interval $[-\pi, \pi]$.

- (a) Write the probability density function of θ .
- (b) Find the mean function of the process $\{X(t)\}$
- (c) Whether the process $\{X(t)\}$ is a weak stationary or not? Prove it. (CO-5)[5M]

Q.8. On any given day, the weather in a town can be classified as sunny, cloudy or rainy. The state transition diagram is given below.

- (a) Write the probability transition matrix of this Markov chain.
- (b) If initial probabilities are given as $[0.3 \ 0.5 \ 0.2]$, then find the unconditional probability if it will rain after two days. (CO-5)[5M]



Statistical Tables

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	9.55	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

df	$\chi^2_{.995}$	$\chi^2_{.990}$	$\chi^2_{.975}$	$\chi^2_{.950}$	$\chi^2_{.900}$	$\chi^2_{.100}$	$\chi^2_{.050}$	$\chi^2_{.025}$	$\chi^2_{.010}$	$\chi^2_{.005}$
1	0.000	0.000	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	9.236	11.070	12.833	15.086	16.750