

Unique Paper Code : 32377910  
Name of the Paper : Survival Analysis and Bio-Statistics  
Name of the Course : B.Sc.(Hons) Statistics under CBCS(New Course)  
Semester : VI  
Duration : 3 hours  
Maximum Marks : 75 Marks

*Instructions for Candidates:*

1. Attempt **four** questions in all.
2. All questions carry equal marks.
3. Use of calculator is allowed.

1. Briefly explain both the non- parametric methods to estimate the survival function. The data of 220 patients with chronic kidney disease diagnosed in Apollo Hospital in year 2020 is given below:

Year after diagnosis	Alive at the beginning of the Interval	Died during the interval	Lost to follow-up	Withdrawn alive during the interval
0-1	220	61	3	11
1-2	145	4	5	09
2-3	127	2	-	14
3-4	111	2	3	5
4-5	101	-	-	1

Use the appropriate method to estimate  $S(t_i)$  and  $\text{var}(S(t_i))$  for each interval.

2. Explain and compute the probability of death applicable to the current pandemic risk for the following data:

Age interval	Mid year population	Death due to COVID-19	Death due to road accidents	Death due to CVD	Death due to Thalassemia	Total number of deaths
1-5	70630	740	60	615	28	5706
5-10	81911	440	80	819	15	6700
10-20	74885	384	250	1084	77	7000
20-35	105675	3050	300	1250	58	15000
35-50	127567	3500	70	1157	60	16000
50-70	140752	3623	58	1652	61	15799

Also, find the probability of death due to COVID -19 after eliminating least operating risk at this time.

3. Explain the terms control, placebo and random control trials used in clinical trials for the vaccine Covishield. Also, describe different phases of clinical trials involved before it is approved as an Anti COVID-19 drug.

4. Compute all functions of survival analysis for the following data:

Age Interval	Number of patients surviving at the beginning of interval	Number of patients dying in the interval
0-5	7,407	409
5-10	6,998	233
10-15	6,765	214
15-20	6,551	440
20-25	6,111	594

25-30	5,517	612
30-35	4,905	761
35-40	4,144	800
40-45	3,344	885
45-50	2,459	980
>=50	1,479	1,024

Also, plot the hazard function and comment on its nature.

5. Compare the efficacy of two drugs, Afinitor and Temador where 17 patients with tumor were given Afinitor in Rajeev Gandhi hospital and 16 patients were given Temador in Sir. Ganga Ram hospital. In both the hospitals, doctors decided to terminate the study after the death of 10 patients. The survival times (in months) are given below:

Afinitor	5	6	7.5	8	11	14	15	21	24	28	30	33	34	40	46	47	48
Temador	6	6.5	7	7.5	8	9	10	12	14	18	19	25	34	38	45	54	

Assuming the time of death of these patients follow exponential distribution explain the applied censoring scheme .

6. Construct the segregation matrices for all the gametes under homologous crossing. Compute  $g_1$ ,  $g_2$ ,  $g_3$  and  $g_4$  for the third, fifth and seventh generation for  $g_1 = 0.3$ ,  $g_2 = 0.4$ ,  $g_3 = 0.1$ ,  $g_4 = 0.2$  and  $\lambda = 0.4$ .



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