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UG/5th Sem/STAT(H)/Pr/19

2019

B.Sc. (Honours)

5th Semester Examination

STATISTICS

Paper - DSE 2-P

Stochastic Processes and Queuing Theory

Full Marks : 20

Time : 3 Hours

*The figures in the margin indicate full marks.  
Candidates are required to give their answers  
in their own words as far as practicable.*

Answer all questions

1. Show that the Markov chain with states  $\{E_1, E_2, E_3\}$  and the transition probability matrix

$$P = \begin{pmatrix} 0.6 & 0.4 & 0 \\ 0 & 0.5 & 0.5 \\ 0.2 & 0.4 & 0.4 \end{pmatrix} \text{ is irreducible.} \quad 5$$

[ Turn Over ]

( 2 )

2. Consider the following transition probability matrix concerning the two-state Markov chain about weather conditions — '0' if it rains and '1' if it does not :

$$P = \begin{pmatrix} 0.6 & 0.4 \\ 0.4 & 0.6 \end{pmatrix}.$$

Compute the probability that it will rain five days from today given that it is raining today. 5

3. Suppose that immigration into a country occurs at a poisson rate of 2 per day.

(i) What is the probability that the time elapsing between the 4th and 5th immigrations exceeds 3 days ?

(ii) What is the expected time of the arrival of the 4th immigrant ?  $2+3=5$

4. Laboratory Note Book. 2
5. Viva-voce. 3
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### Survival Analysis

Full Marks : 20

Time : 2 Hours

*The figures in the margin indicate full marks.  
Candidates are required to give their answers  
in their own words as far as practicable.*

Answer *all* questions

1. The following table gives the remission times for 2 groups of leukemia patients one given the drug 6 mp and the other a placebo.

Calculate the Kaplan Meier estimates of the survival functions for the two groups and plot on a graph paper.

Length of remissions in weeks

6 mp	Placebo
6	1
6	1
6	2
6*	2
7	3
9*	4
10	4

[ Turn Over ]

( 4 )

10*	5
11*	5
13	8
16	8
17*	8
19*	8
20*	11
22	11
23	12
25*	12
32*	15
32*	17
34*	22
35*	23

\*quantities denote censored observations. 8

2. Plot the failure rate (or hazard rate) function of a system having failure time distribution with p.d.f.

$$f(x) = 2.7t^2e^{-0.9t^3} ; t \geq 0$$

Also find the value of the survival function of the system for a mission time of 0.15 unit. 7

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3. Laboratory Note Book. 3

4. Viva-voce. 2

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