PG (CBCS) EVEN SEMESTER EXAMINATION, 2024

STATISTICS

4th Semester

Course No. : STSCC - 404

(Industrial Statistics and Optimization Techniques-II)

Full Marks : 70

Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

(Answer five questions taking one from each unit)

Unit - I

1. If the failur distribution is gamma, and Weibull then obtain the expressions for reliability function, MTTF and hazard function. What will be the effect on shape of hazard rate curve with the change in the value of shape parameter in this case? 7+7=14

2. (a) State the basic assumptions of an exponential failure model. Also obtain the distribution from these assumptions. Show that hazard rate is constant for this model. 8

   (b) Define a series system with n components and obtain its reliability function. Also show that system hazard rate is equal to the sum of the component hazard rates. 3+3=6

Unit - II

3. (a) Define an IFR distribution. Assuming that F has a density f with $F(O^-) = 0$. Then show that F is IFR iff h(t) is increasing (decreasing). 3+5=8

   (b) Show that for a coherent system of independent component each of which has an IFRA failur distribution, has a system failur distribution which is also IFRA. 6

4. (a) Assuming $F(O^-) = O$ and F is an IFR distribution, show that log $\overline{F}(t)$ is concave for t in $\{ t/\overline{F}(t) < 1; t \geq 0 \}$ 5

   (b) If F is IFR distribution, then prove that $\{\overline{F}(t)\}^{1/t}$ is decreasing. 3

   (c) Write the structure functions of series, parallel and k out of n system. 4

   (d) Define redundancy. 2

Unit - III

5. Define queuing system with suitable examples. What are the advantages of this system? Discuss the assumptions of M|M|1 queuing model. Also obtain the steady-state difference-differential equation for this model. 3+2+3+6=14

6. (a) Discuss the various characteristics of a queuing system. 5

   (b) Obtain the system of steady-state equations of {(M|M|S) : (α|FCFS)} model. 9

Unit - IV

7. Describe the method of monte carlo and inversion methods of simulation. 14

8. Describe the method of simulation of Bernoulli random variable using uniform distribution by using inversion method. 14

Unit - V

9. Describe the mean and standard deviation charts and also describe the situations where it required. 7+7=14

10. Describe the number of defects and defective charts. 7+7=14

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