No of Pages : 2 Course Code : 12XW21

Roll No:
(To be filled in by the candidate)

PSG COLLEGE OF TECHNOLOGY, COIMBATORE - 641 004

SEMESTER EXAMINATIONS, FEBRUARY / MARCH - 2014

M.Sc - SOFTWARE ENGINEERING Semester : 2

12XW21 PROBABILITY AND STATISTICS

Time : 3 Hours **Maximum Marks : 100**

INSTRUCTIONS:

1. Group I, Group II and Group III questions should be answered in the Main Answer Book.
2. Ignore the box titled as **"Answers for Group III"** in the Main Answer Book.
3. Answer **ALL** questions from GROUP – I.
4. Answer any **4** questions from GROUP – II.
5. Answer any **ONE** question from GROUP – III.
6. **Statistical tables to be permitted.**

GROUP - I **Marks : 10 × 3 = 30**

1. If A and B are mutually exclusive and exhaustive events with $P[B] = 2 \times P[A]$, find $P[A]$.
2. A die is rolled three times. What is the probability that exactly one odd number turns up among the three outcomes?
3. Can a binomial distribution have mean 2 and variance 4? Why or why not?
4. What is memory-less property in Geometric distribution? Give a real-life example.
5. For a random variable X, $E[X] = 1, Var(X) = 2$, then find the value of $E[(X+1)^2]$.
6. In what situations Weibull distribution is preferred over exponential distribution?
7. Distinguish between a point estimate and an interval estimate.
8. What is an unbiased estimator? Give an example.
9. If a null hypothesis cannot be rejected at 5% LOS, can it be rejected at 1%? Justify.
10. In hypothesis testing, what does it mean that the probability of making type I error is 0.05?

GROUP - II **Marks : 4 × 12.5 = 50**

11. In a certain assembly plant, three machines B_1, B_2, and B_3 make 30%, 45%, and 25% respectively, of the products. It is known, from past experience that 2%, 3%, and 2% of the products made by each machine, respectively are defective. Now, suppose that a finished product is randomly selected. What is the probability that it is defective? Given that a product is defective, what is the probability that it was made by machine B_2?
12. The joint probability density function of two random variables X and Y where X is the unit temperature change and Y is the proportion of spectrum shift that a certain atomic particle produces, is given by $f(x,y) = \begin{cases} 10xy^2, & 0 < x < y < 1 \\ 0, & otherwise \end{cases}$.
    i) Find the marginal densities functions $f_X(x)$ and $f_Y(y)$ ii) Find the probability that the spectrum shifts more than half of the total observations, given that the temperature is increased to 0.25 unit.
13. A city installs 2000 electric lamps for street lighting. The burning life (in hours) of these lamps follows a normal distribution with $\mu = 1000$ and $\sigma = 200$.

How many lamps are expected to fail i) within 700 hours, ii) between 900 and 1300 hours. What is the probability that a lamp will burn for exactly 900 hours.

14. a) The time (in hours) required to repair a machine is exponentially distributed with parameter $\lambda = 1$. Find the probability that a repair takes i) more than 2 hours? ii) at least 3 hours, given that its duration exceeds 2 hours?

b) The average life of a sample of 10 tires of a certain brand was 28400 miles. It is known that the lifetimes of such tires are normally distributed with a standard deviation of 3300 miles. Find a 95% confidence interval for the mean life.

15. a) A departmental asked 500 of its customers whether they were satisfied with the service or not. The data obtained were as in Table.1. At 5% LOS, test the null hypothesis that the customer satisfaction does not depend on the gender. [6]

TABLE 1

	Male	Female
Satisfied	140	231
Not satisfied	39	90

b) The data in Table.2 are the average loses of worker-hours due to accidents in ten industrial plants before and after a certain safety program was put into operation. Use 5% LOS to test whether the safety program is effective.

TABLE 2

Before	45	73	46	124	33	57	83	34	26	17
After	36	60	44	119	35	51	77	29	24	11

GROUP - III

Marks : 1 × 20 = 20

16. a) Distinguish between correlation and regression. State their uses. [5]

b) The owner of a business unit is concerned about the sales pattern of his product. He believes that two factors - advertisement and price - are major determinants. He has collected the data in Table.3.

TABLE 3

Sales(units sold)	37	65	75	87	22	29
Advt. expenditure (` '000)	7	10	14	17	13	10
Unit price (`)	1290	1150	1400	1300	1450	1400

Determine the regression equation to predict sales from advertisement and price. Predict the amount of sales if the advt. expenditure is `11000 and price is `1320. [15]

17. a) What is analysis of variance? What are its advantages? [5]

b) An important consideration in deciding which database management system to employ is the mean time required to learn how to use the system. A test was designed involving three systems and four users. Table.4 gives the amount of time (in hours) each user took in training with each system.

TABLE 4

	User 1	User 2	User 3
System 1	44	38	47
System 2	46	40	52
System 3	34	36	44

At 5% LOS, perform ANOVA to test the hypothesis that i) the mean training time is the same for all the systems; ii) the mean training time is the same for all the users. [15]

/END/

FD/RL