I B. Tech II Semester Regular Examinations, June, 2015

Fundamentals of Probability and Statistics

(Bio Technology)

Time: 3 hours   Max Marks: 70

PART – A
Answer ALL questions. All questions carry equal marks.

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10 * 2 Marks = 20 Marks

1). a   Write the formulas to compute the Arithmetic Mean and Standard Deviation of a   **[2]**
   discrete data set $\{x_1, x_2, x_3, \ldots, x_n\}$.

b   State the Addition Law of Probability for two events. How does the Law appear   **[2]**
   when the events are independent?

c   Write the Probability Density Function of a random variable X that follows a Normal   **[2]**
   Distribution with mean μ and Standard Deviation σ. How does the graph of this
   density function appear?

d   Write the equations of Regression Lines. What is the relation between Regression   **[2]**
   Coefficients and the Coefficient of Correlation?

e   Find $E(X)$ for a random variable having the following Probability Distribution.   **[2]**

x_i	0	1	3	5
p_i	0.125	0.5	0.125	0.25

f   Write the normal equations associated with the least squares straight line $\hat{y} = a + bx$.   **[2]**

g   State Baye's Theorem of Probability.   **[2]**

h   Write the Probability Mass Function of a random variable X that follows a Poisson   **[2]**
   distribution with parameter $\lambda = 1.5$

i   Write the sample space associated with tossing a pair of fair dice.   **[2]**

j   Justify that Regression Lines intersect at the mean of the data.   **[2]**

PART – B
Answer any FIVE questions. All questions carry equal marks.
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5 * 10 Marks = 50 Marks

2.　(a) Determine the Median of the following uniform data　　　　　　　**[10]**

Heights	0-8	8-16	16-24	24-32	32-40
Frequency	12	20	28	24	16

(b) In an urban locality of a metropolis, the following distribution was observed about the newspapers being subscribed. Draw a pie chart summarizing this data

News paper	The Hindu	Indian Express	Times of India	Siasat	Hindi Milap
Subscribers	1200	900	1100	600	200

3.　(a)　A　and　B　are　two　events　with　individual　probabilities **[10]** $P(A) = \dfrac{1}{3}$ *and* $P(B) = \dfrac{1}{5}$ Estimate $P(A \cup B)$ given the information that the events are independent.　　　　　　　　　　　　　　　　　　　　[4]

(b) 70% of a college is composed of boys. The rest are girls. 60% of boys and 70% of girls are computer literate. If a student of the college is randomly selected, what is the chance that the person is a computer literate girl?　　　　　　[6]

4.　(a) 30% of Guinea Pigs in a lab are infected with cancer. If a sample of 8 guinea pigs **[10]** is randomly selected, estimate the probability that at least 2 are infected by cancer.
(b)　A　continuous　random　variable　X　has　the　probability　density $f(x) = k\, x^2$, $1 \le x \le 3$　　Estimate (i) k　　　and　　(ii) $P(1 \le X \le 2)$

5.　A Poisson Variate X has the property: $P(X = 2) = \dfrac{1}{3} P(X = 3)$ Estimate the Poisson **[10]** parameter and also $P(X < 2)$.

6. Bacterial growth in a certain culture was observed to follow the exponential model $\hat{y} = ab^x$. Estimate the model parameters a and b given the following information.

[10]

x (sec)	0	1	2	3	4
y (bacteria in '00)	5.44	6.80	8.501	10.63	13.28

7. Determine the Regression Lines that correspond to the following data. Also find the Correlation Coefficient.

[10]

x	2	5	6	8	11
y	5.44	9.76	11.20	14.08	18.40

8. (a) Find the Mean, Standard Deviation and Coefficient of Variation of the following data.

[10]

x	0	2	4	6	8
f	10	16	24	18	12

(b) The lengths of feathers of a rare species of vultures are normally distributed with mean 8″ and standard deviation 2″. In a population of 200 such vultures, how many are expected to have lengths in excess of 10″? (You are given that $P(0 < z < 1) = 0.3413$) where Z is the Standard Normal Variate .

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