Register Number: ……..

B.TECH DEGREE EXAMINATIONS: APRIL/MAY 2014

(Regulations 2009)

Third Semester

MAT106: PROBABILITY AND APPLIED STATISTICS

(Common to FT, BIO & TXT)

(Statistical table should be provided)

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The A.M. of the first n natural numbers is
   a) $\frac{n}{2}$ b) $\frac{n(n+1)}{2}$
   c) $\frac{n+1}{2}$ d) $\frac{n^2(n+1)}{2}$
2. If $\sum(x-y)^2 = 72$ and n = 9, then the rank correlation between x and y is
   a) 0.2 b) 0.4
   c) 0.6 d) 0.8
3. The probability that a company director will travel by train is 1/5 and by plane is 2/3. What is probability of his traveling by train or plane?
   a) 11/5 b) 13/15
   c) 2/3 d) 15/13
4. The M.G.F of a random variable having the p.d.f $f(x) = \begin{cases} \frac{1}{3}, -1 < x < 2 \\ 0, otherwise \end{cases}$ is
   a) 1/3t b) 1/3
   c) $\frac{e^{2t}-e^{-t}}{3t}$ d) $\frac{e^{2t}-e^{t}}{3t}$
5. If X is a Poisson variate such that p(X = 0) = 0.5 then the mean is
   a) $\log\left(\frac{1}{2}\right)$ b) –log 2
   c) log 2 d) 1
6. In a binomial distribution mean is 2.4 and variance is 1.44. Then the probability of success p is
   a) 0.3 b) 0.4
   c) 0.6 d) 0.7
7. Given $n_1 = 1200, n_2 = 1500, \overline{x_1} = 68.5, \overline{x_2} = 65.5, s_1 = 2.5, s_2 = 3.0$, the value of the test statistic for testing equality of population means is
   a) 15.19 b) 24. 68
   c) 20.73 d) 28.33
8. Probability of accepting a lot when it is bad is called
   a) Producer's risk b) Consumer's risk
   c) Hypothesis risk d) Statistical risk

9. Lower Control Limit for p – chart is
   a) $\overline{p} + 3\sqrt{\frac{(\overline{p}.\overline{q})}{n}}$ b) $\overline{p} - 3\sqrt{\frac{\overline{p}(1-\overline{p})}{n}}$
   c) $\overline{p} + \sqrt{\frac{\overline{p}.\overline{q}}{n}}$ d) $3\sqrt{\frac{\overline{p}.\overline{q}}{n}}$
10. The test used in ANOVA is
    a) t – test b) F – test
    c) χ^2 – test d) normal test

PART B (10 x 2 = 20 Marks)

11. The average salary of male employees in a firm was Rs.520 and that of females was Rs.420. The mean salary of all the employees was Rs.500. Find the percentage of male and female employees.
12. If r = 0.8 and b_{xy}=1.2 SD_x=2.4, find SD_y & b_{yx}
13. If A and B are independent events with $P(A)=\frac{1}{2} \& P(B)=\frac{1}{3}$, find $P(\bar{A} \cap \bar{B})$.
14. A continuous random variable X has a p.d.f $f(x)=3x^2$ $0 \le x \le 1$. Find 'a' such that $P(X \le a) = P(X > a)$.
15. Let X and Y be independent normal variate with means 1 and 2 and variance 4 and 3 .Find mean and variance of X + 2Y.
16. Find the moment generating function of Poisson distribution.
17. In a city, a sample of 500 people, 280 are tea drinkers and the rest are coffee drinkers.Can we assume that both coffee and tea are equally popular in this city at 5% level of significance?
18. Write down any two properties of t- distribution.
19. Define process control and control chart.
20. What is the aim of design of experiment?

PART C (5 x 14 = 70 Marks)

21. a) (i) Calculate S.D for the following: (7)

Size:	6	7	8	9	10	11	12
Freq:	3	6	9	13	8	5	4

(ii) Find a suitable coefficient of correlation for the following data: (7)

Fertiliser used (tonnes) :	15	18	20	24	30	35	40	50
Productivity (tonnes) :	85	93	95	105	120	130	150	160

(OR)

b) (i) Calculate the two regression equations of X on Y and Y on X from the data given below, taking the deviations from actual means of X and Y (7)

Price (Rs)	10	12	13	12	16	15
Amount Demanded	40	38	43	45	37	43

Estimate the likely demand when the price is Rs.20.

(ii) From the data given below, find the median and mode: (7)

Age	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60
No. of persons	50	70	80	180	150	120	70	50

22. a) (i) A random variable X has density function given by (7)

$f(x) = 2e^{-2x},\ x \geq 0$
$= 0,\quad x < 0$ Obtain the (i) M.G.F, (ii) Four moments about the origin (iii) Mean and (iv) Variance.

(ii) In a bolt factory, machines A, B and C manufacture respectively 25%, 35% and 40% of the total. Of their output 5, 4, 2 percent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machines A, B and C? (7)

(OR)

b) (i) The probability function of an infinite discrete distribution is given by (7)

$P(X = j) = \frac{1}{2^j}\ (j = 1, 2, ...)$. Find (i) Mean of X (ii) $P(X \geq 5)$

(iii) P[X is even] (iv) P [X is divisible by 3]

(ii) The mileage X (in thousand of miles) which are owners get with a certain kind of tyre is a random variable having a probability density function (7)

$$f(x) = \begin{cases} \frac{1}{20} e^{\frac{-x}{20}}, & x > 0 \\ 0 & x \leq 0 \end{cases}$$

Find the probabilities that one of these tyres will last (i) at most 10,0000 miles. (ii) Anywhere from 16,000 to 24,000. (iii) At least 30,000 miles.

23. a) In a test of 2000 electric bulbs it was found that the life of a particular make was normally distributed with an average life of 2040hrs and SD of 60 hrs. Estimate (i) The number of bulbs likely to burn for more than 2150 hrs (ii) less than 1950hrs and (iii) more than 1920 hrs but less than 2160hrs.

(OR)

b) (i) A book of 500 pages contains 500 mistakes. Find the probability that there are atleast four mistakes per page. (7)

(ii) The overall percentage of failure in a certain examination is 40.What is the probability that out of a group of 6 candidates atleast 4 passed the examination. (7)

24. a) (i) Twelve students were given intensive coaching and tests were given before and after the coaching. Is there any improvement due to coaching. (7)

Marks in I test (before) : 50 42 51 26 35 42 60 41 70 55 62 38

Marks in II test (after) : 62 40 61 35 30 52 68 51 84 63 72 50

(ii) In an experiment on immunization of cattle form from tuberculosis the following results were obtained. (7)

	Affected	Unaffected
Inoculated	12	28
Not Inoculated	13	7

Examine the effect of vaccine in controlling the incidence of the disease. (Use $\alpha = 0.05$)

(OR)

b) Two random samples gave the following results:

Sample	Size	Sample mean	Variance
1	8	9.6	1.2
2	11	16.5	2.5

Examine whether the samples come from the same normal population.

25. a) A farmer wishes to test the effects of five different fertilizers A, B, C, D and E on yield of wheat. In order to eliminate sources of error due to variability in soil fertility, he uses the fertilizers in a Latin Square arrangement as indicated in the following table, where the numbers indicate yields in bushels per unit area.

B25	A18	E27	D30	C27
A19	D31	C29	E26	B23
C28	B22	D33	A18	E27
E28	C26	A20	B25	D33
D32	E25	B23	C28	A20

Perform an analysis of variance to determine if there is a significant difference between the fertilizers at $\alpha = 0.05$ levels of significance.

(OR)

b) (i) Draw a control chart for defectives from the data given below : What do you infer ? (7)

Sample No.:	1	2	3	4	5	6	7	8	9	10
No. Inspected:	150	200	200	150	200	300	250	150	200	100
No. of defectives :	7	5	6	6	6	8	8	4	6	3

(ii) The measurements are given below with 5 samples each containing 5 items at equal intervals of time. Construct $\overline{X}$ and R charts and comment on the state of control (7)

Sample no	Measurements				
1	46	45	44	43	42
2	41	41	44	42	40
3	40	40	42	40	42
4	42	43	43	42	45
5	43	44	47	47	45

****