KUMARAGURU
college of technology
character is life

Register Number: ………………..

B.E / B.TECH DEGREE EXAMINATIONS: MAY 2015
(Regulation 2009)

Fourth Semester

MAT106: PROBABILITY AND APPLIED STATISTICS
(Common to CSE & IT)

(Statistical table should be provided)

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

Answer all the Questions:-
PART A (10 x 1 = 10 Marks)

1. If the angle between the two regression lines is Q, then tan Q =

   a) $\left(\dfrac{1-\pi^2}{\pi}\right)\left(\dfrac{\sigma x^2 + \sigma y^2}{\sigma x \sigma y}\right)$

   b) $\left(\dfrac{\pi}{1-\pi^2}\right)\left(\dfrac{\sigma x^2 + \sigma y^2}{\sigma x \sigma y}\right)$

   c) $\left(\dfrac{\pi}{1-\pi^2}\right)\left(\dfrac{\sigma x \sigma y}{\sigma x^2 + \sigma y^2}\right)$

   d) $\left(\dfrac{1-\pi^2}{\pi}\right)\left(\dfrac{\sigma x \sigma y}{\sigma x^2 + \sigma y^2}\right)$

2. Mean – Median is equal to

   a) $\dfrac{1}{3}(mean - \text{mode})$

   b) mean – mode

   c) 3(mean – mode)

   d) mean – 3 mode

3. The probability of getting at least one head while tossing 5 coins is

   a) 4/5

   b) 31/32

   c) 7/8

   d) 63/64

4. Range of the cumulative function F(x, y) is

   a) $(-\infty, \infty)$

   b) $(0, \infty)$

   c) $(-\infty, 0)$

   d) $(0,1)$

5. In normal distribution

   a) mean = mode

   b) standard deviation = mean

   c) median = variance

   d) mean = variance

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. When testing hypothesis about a population proportion from a large sample, standard error is

   a) $\dfrac{p-P}{\sqrt{\dfrac{PQ}{n}}}$

   b) $\sqrt{\dfrac{PQ}{n}}$

   c) $\sqrt{PQ}$

   d) $p-P$

8. In a paired t – test for difference of means, $\bar{d} = -4, S = 8.94, n = 10$, the value of the test statistic is

   a) – 1.414

   b) – 1.728

   c) – 0.728

   d) – 0.414

9. The main aim of the design of experiments is to control the _____

a) extraneous variables   b) experimental variables

c) loss   d) Error

10. If $\overline{C}=3$ then the upper & lower control limits are _____ respectively

a) (0,3)   b) (3,0)

c) (1.26, 4.73)   d) (–2.20, 8.20)

PART B (10 x 2 = 20 Marks)

11. If r = 0.8 and b_{xy}=1.2, SD_x=2.4, find SD_y & b_{yx}.

12. Mean of 20 values is 45. If one of these values is to be taken 64 instead of 46. Find the corrected mean.

13. State the axioms of probability.

14. If the random variable has the mgf $M_X(t)=\dfrac{2}{2-t}$, determine the variance of X.

15. Let X be a random variable which assumes Poisson distribution. Find $P(X=4)$ if $P(X=1)=P(X=2)$.

16. Write the Physical conditions of Binomial distribution.

17. Write any two application of t-distribution.

18. It has been claimed that the mean weight of women students at a college is 54. 4 kg and the standard deviation σ = 5. 4 kg. The sports professor does not believe this statement. To test the claim, he makes a random sample of size 100 among the women students and finds the mean = 53.75 kg. Is this sufficient evidence to reject the statement at the significance level α = 0.05?

19. Compare and contrast the Latin Square Design with Randomized Block experiment?

20. Define process control and control chart.

PART C (5 x 14 = 70 Marks)

21. a) The following table gives the distribution of wages in the two branches of a factory:

Monthly wages('00Rs)	Number of workers	
	Branch A	Branch B
100-150	167	63
150-200	207	93
200-250	253	157
250-300	205	105
300-350	167	82
Total	1000	500

Find the mean and S.D for the two branches for the wages separately and discuss the following.

  (i) Which branch pays higher average wages?

  (ii) Which branch has greater variability in wages in relation to the average wages?

  (iii) What is the average monthly wage for the factory as a whole?

  (iv) What is the variance of wages of all of the workers in the two branches A&B taken together?

(OR)

b) Price indices of cotton and wool are given below for the 12 months of a year. Obtain the equations of lines of regression between the indices. Also estimate the correlation co efficient.

Price index

Of cotton (X): 78 77 85 88 87 82 81 77 76 83 97 93

Price index

Of wool(Y): 84 82 82 85 89 90 88 92 83 89 98 99

22. a) (i) A discrete Random Variable has the following probability distribution. (8)

x :   -2   -1   0   1   2   3

P(x) :   0.1   k   0.2   2k   0.3   3k

Find (i) The value of k   (ii) Mean of X   (iii) P (X < 2)   and
P (-2<X < 2)   (iv) cumulative distribution function of X.

(ii) In a bolt factory, machines A, B and C manufacture respectively 25%, 35% and (6)
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 machine A?

(OR)

b) (i) A random variable X has density function given by (8)

$$f(x) = 2e^{-2x}, \ x \geq 0$$
$$= 0, \quad x < 0$$

.Obtain the (i) M.G.F, (ii) Four moments about the

origin (iii) Mean and (iv) Variance.

(ii) A toy is rejected if the design is faulty or not. The probability that the design is (6)
faulty is 0.1 and that the toy is rejected if the design is faulty is 0.95 and
otherwise 0.45. If a toy is rejected what is the probability that it is due to faulty
design.

23. a) (i) If on the average rainfalls on 10 days in every 30 days , Obtain the probability (7)
that (i) rain will fall on at least 3 days of a week and (ii) first 3 days of a given
week will be fine and the remaining 4 days wet, by constructing a binomial
distribution.

(ii) In a test of 2000 electric bulbs it was found that the life of a particular make was (7)
normally distributed with an average life of 1000hrs and SD of 200 hrs. Estimate
(i) the number of bulbs likely to fail in the first 700 burning hrs   (ii) the number
of bulbs likely to burn for more than 2150 hrs.

(OR)

b) (i) Construct a normal curve to the following data and compare the theoretical (8)
frequencies with the observed frequencies:

Length of line in cm	8.60	8.59	8.58	8.57	8.56	8.55	8.54	8.53	8.52	Total
Frequency	2	3	4	6	9	7	5	2	2	40

(ii) In a certain factory manufacturing razor blades, there is small chance of 1/500 for (6)
any blade to be defective. The blade is in packets of 10. Use Poisson distribution to
calculate the approximate number of packets containing   (i) no defective   (ii) one
defective (iii) 2 defective blades respectively in a consignment of 10,000 packets.

24. a) 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.

(OR)

b) (i) The theory predicts that the proportion of beans in the 4 groups A,B,C and D (7) should be 9:3:3:1. In an experiment among 1600 beans , the numbers in the four groups were 882,313,287 and 118. Do the experimental results support the theory?

(ii) An auto company decided to introduce a new six cylinder car whose mean petrol (7) consumption is claimed to be lower than that of the existing auto engine. It was found that the mean petrol consumption for the 50 cars was 10 km per litre with a standard deviation of 35 km per litre. Test for the company at 5% level of significance, whether the claim the new car petrol consumption is 9.5 km per litre on the average is acceptable?

25. a) An industrial engineer tests 4 different shop-floor layouts by having each of 6 work crews construct a subassembly and measuring the construction times (minutes) as follows:

	Layout 1	Layout 2	Layout 3	Layout 4
Crew A	48.2	53.1	51.2	58.6
Crew B	49.5	52.9	50.0	60.1
Crew C	50.7	56.8	49.9	62.4
Crew D	48.6	50.6	47.5	57.5
Crew E	47.1	51.8	49.1	55.3
Crew F	52.4	57.2	53.5	61.7

Test at the 0.01 level of significance whether the 4 floor layouts produce different assembly time and whether some of the work crews are consistently faster in constructing this subassembly than the others.

(OR)

b) (i) Construct $\overline{X}$ - chart and R- chart for the following data from 20 samples and (10) interpret the result.

Sample	1	2	3	4	5	6	7	8	9	10
$\overline{X}$	1.75	1.32	1.17	0.48	2.30	1.25	1.52	1.77	1.9	1.72
R	1	1.3	0.4	0.5	1.4	1.9	1	1.3	2.4	2
Sample	11	12	13	14	15	16	17	18	19	20
$\overline{X}$	2.4	2.7	2.52	2.05	1.67	2	1.27	1.92	1	1.35
R	1.9	2.7	1.7	1.6	1.5	3.1	2.6	2.7	1	1.7

(ii) Give the Layout of a Latin Square Design with four treatments. (4)

****