Register Number: ……..

B.E/B.TECH DEGREE EXAMINATIONS: APRIL/MAY 2012

Fourth Semester

MAT106: PROBABILITY AND APPLIED STATISTICS

(Computer Science Engineering & Information Technology)

(Statistical tables to be given)

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

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks)

1. Median for the following distribution 25, 20, 15, 35, 18 is _____

   a) 20 b) 15 c) 25 d) 35

2. If the correlation coefficient is zero, then the two regression lines

   a) are parallel to each other b) are perpendicular to each other

   c) Coincide with each other d) meets at 45

3. The density function of a random variable X is given by f(x) = k x (2-x), $0 \le x \le 2$ then k =

   a) 3/5 b) 2/4 c) 3/4 d)1/2

4. If Mean = 1 and $E(X^2) = 7/6$ then variance of X is

   a) 1/6 b) 6 c) -1/6 d) 13/6

5. For a binomial distribution mean is 2.4 and variance is 1.44. Then the probability of success p is

   a) 0.6 b) 0.4 c) 0.3 d) 0.7

6. Which of the following is the basic property of the Normal Distribution?

   a) Mean = mode=median b) mean = variance

   c) Standard deviation = mean d) median = variance

7. Degrees of freedom for testing the difference between two means in the small sample is

   a) $n_1 + n_2 - 2$ b) $n_1 - 2$ c) $n_2 - 2$ d) $n_1 + n_2 - 1$

8. Which of the following is the test statistic for single mean if the sample size is greater than 30?

   a) $Z = \left| \frac{\bar{x} - \mu}{\sigma} \right|$ b) $Z = \left| \frac{\bar{x} - \mu}{\sqrt{n}} \right|$ c) $Z = \left| \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} \right|$ d) $Z = \left| \bar{x} - \mu \right|$

9. In CRBD if the mean sum of squares due to treatments in 15.075 and the mean sum of squares due to error is 6.811 then the F – ratio is _____

   a) 1.96 b) 3.06 c) 2.21 d) 0.4518

10. Lower Control Limit for P – chart is

a) $\bar{p}+3\sqrt{\frac{\left(\bar{p}.\bar{q}\right)}{n}}$ b) $\bar{p}-3\sqrt{\frac{\bar{p}\left(1-\bar{p}\right)}{n}}$ c) $\bar{p}+\sqrt{\frac{\bar{p}.\bar{q}}{n}}$ d) $3\sqrt{\frac{\bar{p}.\bar{q}}{n}}$

PART B (10 x 2 = 20 Marks)

11. What are the measures of dispersion?
12. Define correlation using scatter diagram.
13. State the mathematical definition of probability.
14. If X and Y are independent random variable with variances 2 and 3 respectively. Find the variance of (3X + 4Y).
15. Derive the M.G.F of the binomial distribution. Hence find its mean.
16. Define Standard Normal distribution.
17. Define Type – I error and Type – II error.
18. Write the application of the t – distribution.
19. What are the three basic principles of design of experiments?
20. Why a 2 x 2 Latin Square is not possible?

PART C (5 x 14 = 70 Marks)

21. a) (i) Calculate Arithmetic mean, median and mode from the following data:

X	: 0-5	5-10	10-15	15-20	20-25
f	: 7	18	25	30	20

(7)

(ii) Calculate the Arithmetic mean and standard deviation from the following data:

Class:	5-15	15-25	25-35	35-45	45-55
Freq:	8	12	15	9	6

(7)

(OR)

b) Find out the coefficient of correlation for the following case.

Height of father (in inches)	65	66	67	67	68	69	71	73
Height of son (in inches)	67	68	64	68	72	70	69	70

22. a) (i) A manufacturer firm produces steal pipes in three plants, with daily production volume 500; 1,000 and 2,000 units respectively. According to past experience, it is known that the fractions of defective outputs produced by these plants are respectively 0.005, 0.008, and 0.010. If a pipe is selected from day's total production and found to be defective, what is the probability that it came from the first plant? (6)

(ii) A discrete random variable X has the probability function given below:

Values of X, x:	0	1	2	3	4	5	6	7

P(X):	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$

Find 1. The value of k

2. $P(X<6)$ & $P(0<X<4)$

3. The distribution function of X.

4. Find the value of 'a' such that P(X ≤ a)>1/2. (8)

(OR)

b) Find the moment generating function (M.G.F) of the distribution:

$$f(x)=\begin{cases} K\ e^{-Kx}, & x>0 \\ 0 & otherwise \end{cases}$$

Hence find 1) Mean 2) Variance 3) μ_3' 4 μ_4'

23. a) (i) It has been found that 80% of the printers used on home computers operate correctly at the time of installation. A particular dealer sells 10 units during a given month.

1. Find the probability that atleast nine printers operate correctly on installation.
2. Consider 5 months, in which 10 units are sold per month. What is the probability that at least nine units operate correctly in each of the 5 months. (7)

(ii) 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

1. The number of bulbs likely to burn for more than 2150 hrs
2. Less than 1950hrs and
3. More than 1920 hrs but less than 2160hrs. (7)

(OR)

b) The following table shows a customer returning the products in a market area. Fit a Poisson distribution and also find expected frequencies.

No., of returns:	0	1	2	3	4	5	6
No., of Stores:	4	14	23	23	18	9	9

24. a) Two random samples gave the following results:

Sample	Size	Sample mean	Sum of the square of deviations from the mean
1	10	15	90
2	12	14	108

Examine whether the samples come from the same normal population.

(OR)

b) (i) The following data is collected on two characters: .

	Cine goers	Non – Cine goers
Literates	83	57
Illiterates	45	68

Based on this, can you conclude that there is no relation between the habit of cinema going and literacy? (7)

(ii) A simple sample of heights of 6,400 Englishmen has a mean of 67.85 inches and S.D of 2.56 inches, while a simple sample of heights of 1,600 Australians has a mean of 68.55 and S.D of 2.52 inches. Do the data indicate that Australians are on the average taller than Englishmen? (7)

25. a) (i) The following data represents the number of units of productions per day turned out by different workers using four different types of machines.

		Machine Type			
		A	B	C	D
	1	44	38	47	36
Workers	2	46	40	52	43
	3	34	36	44	32
	4	43	38	46	33
	5	38	42	49	39

Test whether the 5 men differ with respect to mean productivity and test whether the mean productivity is the same for the four different machine types. (8)

(ii) 10 samples each of size 50 were inspected and the number of defectives in the inspection were 2, 1, 1, 2, 3, 5, 5, 1, 2, 3. Draw the np control chart for defectives. (6)

(OR)

b) The figures in the following 5x5 Latin Square are the numbers of the engines E_1, E_2, E_3, E_4&E_5 tuned up by mechanics M_1, M_2, M_3, M_4&M_5 ran with gallon of fuel A, B, C, D and E.

	E_1	E_2	E_3	E_4	E_5
M_1	A31	B24	C20	D20	E18
M_2	B21	C27	D23	E25	A31
M_3	C21	D27	E25	A29	B21
M_4	D21	E25	A33	B25	C22
M_5	E21	A37	B24	C24	D20

Use the level of significance $\alpha = 0.01$ to test

(i) The null hypothesis H_0 that there is no difference in the performance of the five engines

(ii) H_0 that the persons who tuned up these engines have no effect on their performance

(iii) H_0 that the engines perform equally well with each of the fuels.

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