Register Number: ……………………..

B.E/B.TECH DEGREE EXAMINATIONS: JUNE 2013

Third Semester

MAT106: PROBABILITY AND APPLIED STATISTICS

(Common to TXT/FT/BT)

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

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

1. 10 is a mean of set of 7 observations and 5 is the mean of a set of 3 observations. The mean of the combined set is _____
   a) 15
   b) 8.5
   c) 10
   d) 7.5

2. If cov $(x, y) = 3$ and $v(x) = 4.5$ $v(y) = 5.5$ then the correlation co-efficient is _____
   a) 0.5
   b) 0.603
   c) 0.3
   d) 0.1212

3. If an event cannot take place, the probability will be
   a) +1
   b) -1
   c) 0
   d) Not defined

4. If $M_x(t) = 1 + \dfrac{t}{a} + \dfrac{t^2}{a^2} + \dfrac{t^3}{a^3} + \ldots\ldots$ then the first moment about the origin is
   a) t/a
   b) 1/a
   c) 1/a^3
   d) $1/a^2$

5. In Poisson distribution, mean and variance respectively are
   a) λ, λ^2
   b) $\lambda, \dfrac{1}{\lambda}$
   c) λ, λ
   d) λ^2, λ

6. In normal distribution
   a) mean = mode=median
   b) median = variance
   c) standard deviation = mean
   d) mean = variance

7. The small sample test used for testing the equality of two variances is
   a) t – test
   b) normal test
   c) χ^2 – test
   d) F – test

8. Type I error is
   a) Rejecting a lot when it is bad
   b) Rejecting a lot when it is good
   c) Accepting a lot when it is bad
   d) Accepting a lot when it is good

9. Two way classification is also called
   a) completely randomized design
   b) randomized block design
   c) Latin square design
   d) standard design

10. Upper Control limit for $\bar{R}$ chart is
    a) $\bar{\bar{X}} - A_2 \bar{R}$
    b) $D_4 \bar{X}$
    c) $D_4 \bar{R}$
    d) $\bar{\bar{X}} + A_2 \bar{R}$

PART B (10 x 2 = 20 Marks)

11. What is coefficient of variation?
12. Write any two properties of correlation coefficient.
13. State the Total Probability Theorem.
14. A continuous random variable X follows the probability law $f(x)=\begin{cases} k(x-1)^3 & ; 1\le x\le 3 \\ 0 & ,otherwise \end{cases}$; find k.
15. Find E(X), for a Poisson random variable if E(X^2)=6.
16. State the basic properties of Standard Normal Curve.
17. Define Null hypothesis.
18. Write down any two properties of χ^2 - distribution.
19. Why a 2 x 2 Latin Square is not possible? Explain.
20. When do you say that a process is out of control?

PART C (5 x 14 = 70 Marks)

21. a) (i) Calculate Median and Mode of the data given below. Using them find arithmetic mean. (7)

Marks:	20	30	40	50	60	70
No. of Students:	8	28	45	60	75	80

   (ii) Calculate Karl Pearson's coefficient of correlation between age and playing habits from the data given below. (7)

Age:	20	21	22	23	24	25
No. of students	500	400	300	240	200	160
Regular players	400	300	180	96	60	24

(OR)

   b) (i) The number of employees, average wages per employee and the variance of the wages per employee for two factories is given below: (6)

	Factory A	Factory B
Number of employees	50	60
Average wage per employee per month(Rs.)	60	48
Variance of the wages per employee per month(Rs.)	100	144

   In which factory is there greater variation in the distribution of wages per employee?

   (ii) In a correlation study the following values are obtained: (8)

	X	Y
Mean	30	35
Standard Deviation	10	7
Coefficient of correlation	0.8	

   Find the two regression equations that are associated with the above values.

22. a) (i) If A and B are independent events, then prove that A and $\bar{B}$ are also independent. (4)

(ii) Three machines all turn out non ferrous castings. Machine A produces 1% (10) defective and machine B- 2% and machine C- 5%. Each machine produces $\frac{1}{3}$ of the output. An inspector examines a single casting, which he determines as non defective. Estimate the probabilities of its having been produced by each machine.

(OR)

b) (i) A random variable Y has the following distribution (7)

Y:	-2	-1	0	1	2	3
P(Y=y):	0.1	K	0.2	2k	0.3	3k

(1) Find ' k' (2) Find P(-2<Y<3) (3)Find the cumulative distribution of Y.

(ii) Find the moment generating function of a random variable X with the pdf (7) $f(x) = \lambda e^{-\lambda x}, x > 0$ and hence obtain its mean and variance.

23. a) (i) Write the Binomial distribution function. State the conditions under which a (4) Binomial distribution can be approximated to a Normal distribution.

(ii) The average daily sales of 500 Branch offices was Rs. 150,000 and the standard (10) deviation Rs.15,000. Assuming the distribution to be Normal, indicate how many branches have sales between :
1. Rs.1,20,000 and Rs.1,60,000,
2. Below Rs.1,40,000 and
3. More than Rs.1,65,000.

(OR)

b) (i) Fit a Poisson distribution for the following distribution: (7)

x:	0	1	2	3	4	5	Total
f:	142	156	69	27	5	1	400

(ii) In a normal distribution, 31% of the items are under 45 and 8% are above 64. (7) Find the mean and standard deviation of the distribution.

24. a) (i) In order to compare the intelligence quotient of students, two schools were (7) selected. A random sample of 90 students was selected from each school. At school A, the mean I.Q is 109 and the standard deviation is 11. At school B, the mean I.Q is 98 and standard deviation is 9. Test whether there is any significance difference between schools by means if their I.Q levels.

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

	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	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.

25. a) 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.

(OR)

b) (i) In a certain sampling inspection, the number of defectives found in 10 samples (7) of 100 each are as given below:

16, 18, 11, 18, 21, 10, 20, 18, 17 and 21.

Do these indicate that the quality characteristic under inspection is under statistical control?

Draw the mean chart and range chart using the following data relating to 10 (7)

(ii)

$\overline{X}$:	15	17	15	18	17	14	18	15	17	16
R	7	7	4	9	8	7	12	4	11	5

samples each of size 5 and comment on the state of control.

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