

B.TECH DEGREE EXAMINATIONS: NOV/DEC 2010

Third Semester

MAT 106: PROBABILITY AND APPLIED STATISTICS

(Common to Textile Technology, Textile Technology (Fashion Technology), Bio Technology)

Time: Three Hours**Maximum Marks: 100****Answer ALL Questions:-****PART A (10 x 1 = 10 Marks)**

- A Series has its mean as 15 and its coefficient of variation as 20; its standard deviation is
 (a) 5 (b) 10 (c) 3 (d) 7
- When the regression line of y on x and the regression line of x on y form an angle 90°
 (a) $r = 0$ (b) $r = \pm 1$ (c) $r = 0.5$ (d) $r = -.5$
- What is the probability of getting an even number when a die is tossed?
 (a) $\frac{1}{3}$ (b) $\frac{1}{2}$ (c) $\frac{1}{6}$ (d) 1
- If $\text{mean} = 1$ $E(x^2) = 3$ then variance of x is
 (a) $\frac{1}{6}$ (b) 6 (c) $\frac{-1}{6}$ (d) $\frac{13}{6}$
- In a Binomial distribution,
 (a) $p - q = 1$ (b) $q = 1 + p$ (c) $q = 1 - p$ (d) $p + q = -1$
- If a normal distribution has mean 25 then its mode is
 (a) 15 (b) 50 (c) 25 (d) 35
- When the null hypothesis is $H_0 : \mu = 50$, the alternative hypothesis can be
 (a) $H_1 : \mu = 49$ (b) $H_1 : \mu \neq 49$ (c) $H_1 : \mu < 50$ (d) $H_1 : \mu \geq 51$
- A Contingency table for a chi – square test has 5 columns and 4 rows. How many degrees of freedom should be used
 (a) 20 (b) 9 (c) 15 (d) 12
- In respect of attributes, which of the following charts is used
 (a) R chart (b) P chart (c) \bar{x} chart (d) Control chart for C.
- The process is said to be out of control in a \bar{x} chart when the points are
 (a) above the LCL (b) below the UCL
 (c) between UCL and LCL (d) above the UCL and below the LCL

PART B (10 x 2 = 20 Marks)

11. Find the mean and median for the following data.

745, 2000, 1500, 68000, 46549, 3750, 1800, 4795.

12. Given $\bar{x} = 970$, $\bar{y} = 18$, $\sigma_x = 38$, $\sigma_y = 2$, Correlation coefficient $r = 0.6$. Find the two lines of regression and obtain the value of x when $y = 20$.

13. A bag contains 8 white and 10 black balls. Two balls are drawn in succession. What is the probability that first is white and second is black?

14. Find the moment generating function of the random variable x having pdf

$$f(x) = \begin{cases} x & , \text{ for } 0 < x < 1 \\ 2 - x & , \text{ for } 1 < x < 2 \\ 0 & , \text{ other wise} \end{cases}$$

15. The mean and variance of a Binomial distribution are 4 and $\frac{4}{3}$. Find $P(x \geq 1)$.

16. If x is a Poisson variate such that $P(x = 1) = \frac{3}{10}$, $P(x = 2) = \frac{1}{5}$. Find $P(x = 0)$ and $P(x = 3)$.

17. A normal population has a mean of 6.8 and standard deviation of 1.5. A sample of 400 members gave a mean of 6.75. Calculate the test statistic only.

18. Define Type- I error and Type – II error.

19. What are the three basic principles of ANOVA?

20. What is control chart?

PART C (5 x 14 = 70 Marks)

21. a) (i) Two distributions of 100 and 150 items have means 50 and 40 respectively and standard deviations 5 and 6 respectively. Find the mean all the 250 items taken together (6)

(ii) Find the correlation coefficient for the data (8)

X	25	28	35	32	31	36	29	38	34	32
Y	43	46	49	41	36	32	31	30	33	39

(OR)

b) 10 competitors in a numerical test were ranked by the 3 judges x, y, z in the following order

	A	B	C	D	E	F	G	H	I	J
Rank By x	1	6	5	10	3	2	4	9	7	8
Rank By y	3	5	8	4	7	10	2	1	6	9
Rank By z	6	4	9	8	1	2	3	10	5	7

Using rank correlation discuss which pair of judges has the nearest approach to common likings of music.

22. a (i) State Baye's theorem. (2)

(ii) In a bolt factory machines A, B, C manufacture respectively 25, 35 and 40 percent of the total. Out of their out puts 5, 4 and 2 percent are defective bolts. A bolt is drawn from the product and is found defective. What are the probabilities that it was manufactured by A, B and C? (12)

(OR)

b (i) If a random variable x has the pdf $f(x) = \begin{cases} \frac{1}{2}(x+1), & -1 < x < 1 \\ 0 & , \text{other wise} \end{cases}$.

Find the mean and variance of x . (7)

(ii) Find the moment generating function of the random variable x having pdf

$$f(x) = \begin{cases} \frac{1}{3}, & -1 < x < 2 \\ 0 & , \text{other wise} \end{cases} \quad (7)$$

23. a) Out of 800 families with 4 children each how many families would be expected to have (i) 2 boys and 2 girls (ii) at least one boy (iii) No girl (iv) at most two girls? Assume equal probability for boys and girls.

(OR)

b). Data was collected over a period of 10 years, showing number of deaths from horse kicks in each of the 200 army corps. The distribution of deaths was as follows:

No of deaths	0	1	2	3	4	Total
Frequency	109	65	22	3	1	200

Fir a Poisson distribution to the data and calculate the theoretical frequencies

24. a (i) A sample of heights of 6400 Englishmen has a mean of 170 cm and a S.D of 6.4 cm while another sample of heights of 1600 Americans has a mean of 172cm and a S.D of 6.3cm. Do the data indicates that Americans are, on the average, taller than Englishmen? (7)

(ii) The following data relate to the marks obtained by 11 students in two tests, one held at the beginning of a year and the other at the end of the year after intensive coaching.

Test 1	19	23	16	24	17	18	20	18	21	19	20
Test 2	17	24	20	24	20	22	20	20	18	22	19

Do the data indicate that the students have benefited by coaching?

(OR)

- b) The following table shows the distribution of digits in numbers chosen at random from a telephone directory.

Digits	0	1	2	3	4	5	6	7	8	9
Frequency	1026	1107	997	966	1075	933	1107	972	964	853

Test whether the digits may be taken to occur equally frequently in the directory using chi- square test.

25. a) Four experiments determine the moisture content of samples of a powder, each man taking a sample from each of the six consignments. Their assessments are given as follows.

Consignments

Observers	1	2	3	4	5	6
1	9	10	9	10	11	11
2	12	11	9	11	10	10
3	11	10	10	12	11	10
4	12	13	11	14	12	10

Analyse the data using two – way classification and discuss whether there is any significant difference between consignments or between observers.

(OR)

- b) A machine is said to deliver the packets of a given weight. Ten samples of size five were examined and the following results were obtained.

Sample	1	2	3	4	5	6	7	8	9	10
Mean	15	17	15	18	17	14	18	15	17	16
Range	7	7	4	9	8	7	12	4	11	5

Calculate the values for the central line and the control limits for the mean chart and range chart. Comment on the state of control.
