



Register Number:.....

B.E. DEGREE EXAMINATIONS: MAY 2015

(Regulation 2009)

Fifth Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

MAT106: Probability and Applied Statistics

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Arithmetic mean of a set of observations is their
 - a) Product divided by the number of observations
 - b) Sum divided by the number of observations
 - c) Difference divided by the number of observations
 - d) Number of observation
2. If the regression curve is a straight line then the corresponding regression is said to be
 - a) linear
 - b) quadratic
 - c) Correlation coefficient
 - d) cubic
3. The probability that a leap year selected at random will contain 53 Sundays is
 - a) $\frac{3}{7}$
 - b) $\frac{1}{7}$
 - c) $\frac{4}{7}$
 - d) $\frac{2}{7}$
4. A single letter is selected at random from the word 'probability'. The probability that it is a vowel is
 - a) $\frac{3}{11}$
 - b) $\frac{2}{11}$
 - c) $\frac{4}{11}$
 - d) 0
5. The mean of binomial distribution is
 - a) pq
 - b) $n(1+p)$
 - c) np
 - d) npq
6. The normal distribution is the limiting case of
 - a) Poisson distribution
 - b) Geometric distribution

- c) Negative binomial distribution d) Binomial distribution
7. A region in the sample space S which amounts to rejection of H_0 is termed as
- a) Test of significance b) Critical region
- c) Producer's risk d) Level of significance
8. The χ^2 distribution tends to
- a) Normal distribution for small degrees of freedom b) binomial distribution for small degrees of freedom
- c) Normal distribution for large degrees of freedom d) binomial distribution for large degrees of freedom
9. Upper control limit for \bar{R} chart is
- a) $\bar{\bar{X}} + A_2 \bar{R}$ b) $\bar{\bar{X}} - A_2 \bar{R}$
- c) $D_4 \bar{X}$ d) $D_4 \bar{R}$
10. Which of the following small sample test has been used in ANOVA
- a) F test b) t test
- c) χ^2 test d) Z test

PART B (10 x 2 = 20 Marks)

11. What is standard deviation?
12. What is meant by Regression?
13. State the axioms of probability.
14. State Baye's theorem.
15. State the limitations of normal distribution as binomial distribution
16. The number of monthly breakdown of a computer is a random variable having a Poisson distribution with mean equal to 1.8. Find the probability that this computer will function for a month with only one breakdown.
17. Define errors in sampling and critical region.
18. Write any two applications of t- distribution.
19. What are the assumptions made for ANOVA test?
20. Write the control limits for c-chart.

PART C (5 x 14 = 70 Marks)

21. a) i) Calculate the mean and standard deviation for the following table giving the (7)

age distribution of 542 members.

Age in years :	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of members :	3	61	132	153	140	51	2

- ii) Calculate the correlation coefficient for the following heights (in inches) of fathers (X) and their sons (Y) (7)

X:	65	66	67	67	68	69	70	72
Y:	67	68	65	68	72	72	69	71

(OR)

- b) i) In a partially destroyed laboratory record of an analysis of correlation data, the following results only are legible: variance of X=9. Regression equations: $8X-10Y+66=0$, $40X-18Y=214$. What were (i) the mean values of X and Y. (ii) the correlation coefficient between X and Y. (iii) the standard deviation of Y? (7)

- ii) Find the median wage of the following distribution: (7)

Wages (in Rs.)	:	20-30	30-40	40-50	50-60	60-70
No. of labourers	:	3	5	20	10	5

22. a) i) Obtain the moment generating function of the random variable with the probability (7)

$$\text{density function } f(x) = \begin{cases} \frac{1}{2}e^{-x/2} & ; x > 0 \\ 0 & ; \text{elsewhere} \end{cases} \quad \text{and also find mean and variance of X}$$

- ii) A bag contains 5 balls and it is not known how many of them are white. Two balls are drawn at random from the bag and they are noted to be white. What is the chance that all the balls in the bag are white? (7)

(OR)

- b) i) In an exhibition, the probabilities of hitting the target are $\frac{1}{2}$ for A, $\frac{2}{3}$ for B and $\frac{3}{4}$ for C. If all of them fire at the same target, what are the probabilities that (i) only one of them hits the target (ii) atleast one of them hits the target? (7)

ii) If a random variable X has moment generating function $M_X(t) = 3/(3-t)$. Obtain (7)
the standard deviation of X .

23. a) i) A car hire firm has two cars which it hires out day by day. The number of (7)
demands for a car on each day is distributed as Poisson variate with mean 1.5.
Calculate the proportion of days on which (i) neither car is used and (ii) some
demand is refused.

ii) In a distribution exactly normal, 7% of the items are under 35 and 89% are under (7)
63. What are the mean and standard deviation of the distribution?

(OR)

b) i) The following data shows the number of seeds that germinate out of 10 for 80 (7)
sets of seeds. Fit a binomial distribution to this data

x:	0	1	2	3	4	5	6	7	8	9	10
P(X=x):	6	20	28	12	8	6	0	0	0	0	0

ii) An electrical firm manufactures light bulbs that have length of life which are (7)
normally distributed with $\mu = 800$ hours and $\sigma = 40$ hours. Find the probability
that a bulb burns between 778 and 834 hours.

24. a) i) A machine puts out 16 imperfect articles in a sample of 500. After the machine (7)
is overhauled, it puts out 3 imperfect articles in a batch of 100. Has the machine
improved?

ii) Two random samples drawn from two normal populations are (7)

Sample 1:	20	16	26	27	23	22	18	24	25	19
Sample 2:	27	33	42	35	32	34	38	28	41	43
	30	37								

Obtain the estimates of variances of the population and test whether the
population have the same variances.

(OR)

b) i) The average hourly wage of a sample of 150 workers in plant 'A' was Rs. 2.56 (7)
with a standard deviation of Rs. 1.08. The average hourly wage of a sample of
200 workers in plant 'B' was Rs. 2.87 with a standard deviation of Rs. 1.28. Can
an applicant safely assume that the hourly wages paid by plant 'B' are higher

than those paid by plant 'A'?

- ii) It is believed that the precision (as measured by the variance) of an instrument is (7)
no more than 0.16. Write down the null and alternative hypothesis for testing
this belief. Carry out the test at 1% level given 11 measurements of the same
subject on the instrument.

2.5, 2.3, 2.4, 2.3, 2.5, 2.7, 2.5, 2.6, 2.6, 2.7, 2.5

25. a) The measurements are given below with 5 samples each containing 5 items at
equal intervals of time. Construct \bar{X} and R charts and comment on the state of
control.

Sample No	Measurement				
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

(OR)

- b) i) Set up the analysis of variance for the following results of a Latin square design.
(Use $\alpha = 0.01$) level of significance.

A	C	B	D
12	19	10	8
C	B	D	A
18	12	6	7
B	D	A	C
22	10	5	21
D	A	C	B
12	7	27	17
