KUMARAGURU
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Register Number: ……..

B.E / B.TECH DEGREE EXAMINATIONS: JUNE 2015

(Regulation 2009)

Third Semester

MAT106: PROBABILITY AND APPLIED STATISTICS

(Common to FT/BIO/TXT)

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The algebraic sum of the deviations of all the observations from their mean is

   a) μ b) $\bar{x}$

   c) σ d) 0

2. The mode of the following set of observations: 3, 5, 7, 5, 9, 7, 5, 7, 6, 3, 9, 5, 6, 6, 3 is

   a) 3 b) 6

   c) 5 d) 7

3. The set of values which the random variable X takes is called as the _____ of the random variable.

   a) spectrum b) Rule

   c) indicator d) impulse

4. The second moment about the mean is called

   a) Median b) Variance

   c) Mode d) Standard deviation

5. The approximation of binomial when n is large and p is close to zero is called

   a) Poisson distribution b) Geometric distribution

   c) Normal distribution d) Uniform distribution

6. The _____ is a symmetrical distribution.

   a) Poisson distribution b) Geometric distribution

   c) Normal distribution d) Uniform distribution

7. The group of individuals under study is called

   a) Population b) Statistics

   c) Parameter d) Hypothesis

8. A numerical measure of a sample is called

a) Population b) Statistics

c) Parameter d) Hypothesis

9. Assigning the same number of plots in different blocks is

a) Grouping b) Balancing

c) Blocking d) Controlling

10. There are mainly ____ clauses of variations between items produced under identical conditions in large production process

a) Five b) Three

c) Four d) Two

PART B (10 x 2 = 20 Marks)

11. Find the mean deviation about the mean for the following data: 18, 20, 12, 14, 19, 22, 26, 16, 19, 24.

12. Find the two regression coefficients b_{xy} and b_{yx} for the following data: $\sum x = 24$, $\sum y = 214$, $\sum xy = 306$, $\sum x^2 = 164$, $\sum y^2 = 576$, N = 4.

13. The probability that a company director will travel by train is 1 / 5 and by plane is 2 / 3. What is the probability of his travelling by train or plane?

14. When a die is thrown, X denotes the number that turns up. Find E (X) and Var (X).

15. The mean of a binomial distribution is 5 and standard deviation is 2. Determine the distribution.

16. X is a Poisson random variable such that P (X = 1) = 0.3 and P (X = 2) = 0.2. Find P (X = 0).

17. What are the four possible results when a statistical hypothesis is tested?

18. Give any two assumptions for large samples.

19. Compare RBD and LSD.

20. What is meant by process control with reference to Statistical quality?

PART C (5 x 14 = 70 Marks)

21. a) Obtain the two regression lines from the following data

x	22	26	29	30	31	31	34	35
y	20	20	21	29	27	24	27	31

(OR)

b) The purchasing agent receives samples of envelopes from two suppliers. He had the samples tested in his own laboratory for testing weights with the following results:

Testing weights	Samples from Company	
	A	B
50 – 60	3	10
60 – 70	42	16
70 – 80	22	36
80 - 90	3	8

Which company's envelope is more variable in quality?

22. a) i) A candidate is selected for interview in three different posts. There are 3 candidates for the first post, 4 for the second post and 2 for the third post. What is the probability that he will be selected for one of the posts?

ii) The chance that Doctor D will diagnose disease B correctly is 60 %. The chance that a Patient will die by his treatment after correct diagnosis is 40 % and the chance of death by wrong diagnosis is 70 %. A patient of doctor D who had disease B died. What is the chance that his disease was correctly diagnosed.

(OR)

b) i) Find the mean and variance of the following density function:

$$f(x) = \begin{cases} x & for \quad 0 < x < 1 \\ 2 - x & for \quad 1 < x < 2 \\ 0 & otherwise \end{cases}$$

ii) A random variable X has density function given by $f(x) = \begin{cases} 2e^{-2x}, & x \geq 0 \\ 0, & x < 0 \end{cases}$

Obtain the moment generating function and the first four moments about the origin.

23. a) i) If the chance of running a bus service according to schedule is 0.8, calculate the probability on a day schedule with 10 services:

1) Exactly one is late 2) atleast one is late.

ii) From records of 10 Indian Army corps kept over 20 years the following data were obtained showing the number of deaths caused by the horse. Calculate the theoretical Poisson frequencies.

No. of deaths:	0	1	2	3	4	total
Frequency :	109	65	22	3	1	200

(OR)

b) i) The life of a certain kind of electronic device has a mean of 300 hours and a

standard deviation of 25 hours. Assuming that the distribution of life times which are measured to the nearest hour can be approximated closely with a normal curve,

1) Find the probability that any one of these devices will have a lifetime of more than 350 hours.

2) What percentage will have life time from 220 to 260 hours?

ii) Assume that half of the population is vegetarian so that the chance of an individual being a vegetarian is 1/ 2. Assuming that 100 investigators take samples of 10 individuals each to see whether they are vegetarians, how many investigators would you expect to report that three people or less were vegetarians.

24. a) i) A simple sample of heights of 6400 English men has a mean of 170 cm and a standard deviation of 6.4 cm, while a simple sample of heights of 1600 Americans has a mean of 172 cm and a standard deviation of 6.3 cm. Do the data indicate that Americans are, on the average, taller than the Englishmen?

ii) A sample of size 13 gave an estimated population variance of 3.0, while another sample of size 15 gave an estimate of 2.5. Could both samples be from populations with the same variance?

(OR)

b) The following table gives for a sample of married women, the level of education and the marriage adjustment score:

		Marriage adjustment				
		Very low	Low	High	Very high	Total
Level of Education	College	24	97	62	58	241
	High school	22	28	30	41	121
	Middle school	32	10	11	20	73
	Total	78	135	103	119	435

25. a) i) The average number of defectives in 22 sample lots of 2000 rubber belts was found to be 10%. Obtain the values for central line and control limits for p-chart.

ii) The number of defects detected in 20 items are given below:

Item No.	1	2	3	4	5	6	7	8	9	10
No. of defects	2	0	4	1	0	0	8	1	2	0
Item No.	11	12	13	14	15	16	17	18	19	20

No. of defects	6	0	2	1	0	3	2	1	0	2

Test whether the process is under control. Devise a suitable scheme for the future.

(OR)

b) Analyse the variance in the following Latin square of yields of paddy where A, B, C, D denote the different methods of cultivation

D122	A121	C123	B122
B124	C123	A122	D125
A120	B119	D120	C121
C122	D123	B121	A122

Examine whether the different methods of cultivation have given significantly different yields.

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