W 2630

M.E. DEGREE EXAMINATION, JANUARY 2007.

First Semester

CAD/CAM/Industrial Engineering/Industrial Safety Engineering

MA 1605 — PROBABILITY AND STATISTICS

(Regulation 2005)

Time : Three hours Maximum : 100 marks

(Use of statistical tables is permitted)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write the axiomatic definition of probability.

2. Define 'Poisson Distribution'.

3. What is meant by the principle of 'Least Squares'?

4. Define partial correlation.

5. What is meant by 'level of significance'?

6. Define 'chi-square statistic'.

7. What do you mean by 'Local Control'?

8. What are the demerits of CRD?

9. What is 'Time Series'? What are its components?

10. Describe 'seasonal variation' in a time series.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Define the normal distribution and state its properties. (10)

(ii) Derive the moment generating function of the normal distribution and obtain the mean and variance. (6)

Or

(b) (i) What is 'Regression' and 'Correlation'? State the relationship between correlation and regression in case of two variables. (6)

(ii) The following table shows the height and velocity of a meteor.

Velocity (km/sec) :	11.93	11.81	11.48	10.49	10.13	8.87
Height (kms) :	62.56	57.78	53.1	48.61	44.38	40.57

Find the regression equation of velocity on height. (10)

12. (a) (i) Explain the properties of a good estimator. (4)

(ii) Explain the 'Method of Moments Estimation'. (4)

(iii) Obtain the method of moments estimators of μ and σ^2 based on a random sample of size n from $N(\mu, \sigma^2)$. (8)

Or

(b) (i) Distinguish between partial and multiple correlations with an example. Write the formulae for obtaining them in case of three variables. (8)

(ii) Find the regression equation of X_1 on X_2 and X_3 given the following data results,

	X_1	X_2	X_3
Mean	28.02	4.91	594
Standard deviation	4.42	1.10	85

Correlation : $r_{12} = 0.8$; $r_{23} = -0.56$; $r_{13} = -0.4$

where X_1 = Seed per acre

X_2 = Rainfall in inches

X_3 = Accumulated temperature above 42°F. (8)

(i) What is a hypothesis? What are the main steps involved in testing of a hypothesis? (6)

(ii) Ten persons were appointed in the mechanical division of a firm. Their performance was noted by giving a test at the time of their appointment. After that they were given 6 months training and again they were given a test and their marks of performance were noted.

Employee No :	1	2	3	4	5	6	7	8	9	10
Marks before training :	25	20	35	15	42	28	26	44	35	48
Marks after training :	26	20	34	13	43	40	29	41	36	46

Test whether the employees were benefited by the training. (10)

Or

(b) (i) What is ANOVA? What are the assumptions in ANOVA? (6)

(ii) Explain the procedure of two way ANOVA. (10)

14. (a) (i) What is 'Randomization'? Discuss its role in design of experiments.

(ii) The retail prices of a particular commodity in three principal cities, Bombay, Calcutta and Delhi are observed (in rupees) at four randomly chosen shops in each of the city, as follows :

Bombay	Calcutta	Delhi
16	14	4
8	10	10
12	10	8
14	6	8

Test whether the prices in the three cities are homogeneous or not.

Or

(b) The following data are observed in studying the effect of five different formulations of an explosive mixtures, viz, A, B, C, D, E on the observed explosive force. Each formulation is mixed from a batch of raw material and the formulations are prepared by different operators. The results are arranged in a Latin Square Design.

	Operators				
Raw material batches	1	2	3	4	5
1	A = 24	B = 20	C = 19	D = 24	E = 24
2	B = 17	C = 24	D = 30	E = 27	A = 36
3	C = 18	D = 38	E = 26	A = 27	B = 21
4	D = 26	E = 31	A = 26	B = 23	C = 22
5	E = 22	A = 30	B = 20	C = 29	D = 31

Test whether the formulations are homogeneous with respect to their explosive forces. (16)

15. (a) (i) Explain the mathematical representation of time series. (8)

(ii) Explain the exponential smoothing technique. (8)

Or

(b) (i) Explain autoregressive process and obtain stationarity conditions of AR (1) process. (8)

(ii) Explain the relationship between AR and MA process. (8)

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