

Reg. No. :

--	--	--	--	--	--	--	--	--	--

Question Paper Code: 12011

M.E. DEGREE EXAMINATION, DECEMBER 2013.

First Semester

CAD / CAM

01PMA124 – PROBABILITY AND STATISTICAL METHODS

(Regulation 2013)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. Check whether $f(x) = \frac{1}{\pi} \cdot \frac{1}{1+x^2}$, $-\infty < x < \infty$ is a probability density function.
2. Find the MGF of poisson distribution.
3. Fit a straight line to the following data using the methods of least squares
x: 0 5 10 15 20
y: 7 11 16 20 26
4. Produce the value of the correlation coefficient 'r' for the lines to be
(i) Perpendicular (ii) Coincides
5. Give YATE's correction for 2x2 table.
6. Define alternate hypothesis.
7. What are the basic principles of experimental design?
8. List the three complete block designs.
9. What are the components of time series?
10. Define moving averages.

PART -- B (5 x 16 = 80 Marks)

11. (a) (i) In a bolt factory, machines A, B and C manufacture respectively 25, 35 and 40 percent of the total of their output, 5, 4 and 2 percent are defective bolts. A bolt is drawn at random from the product line and is found defective. What are the probabilities that was manufactured by the machines A, B, or C ? (8)
- (ii) If X represents the outcome, when a fair die is tossed, find the moment generating function of X and hence find $E(X)$ and $Var(X)$ (8)

Or

- (b) Obtain the lines of regression and find the coefficient of correlation from the following.

x:	1	2	3	4	5	6	7	
y:	9	8	10	12	11	13	14	(16)

12. (a) (i) Fit a parabola by the method of least squares to the following data also estimate y at $x = 6$

x:	1	2	3	4	5	
y:	5	12	26	60	97	(8)

- (ii) Find the multiple correlation coefficients $R_{1,23}$ and the partial correlation $r_{12,3}$ for the data, $r_{12} = 0.9$; $r_{23} = - 0.66$ and $r_{13} = - 0.5$ (8)

Or

- (b) X_1, X_2 and X_3 is a random sample of size 3 from a population with mean value μ and variance σ^2 , T_1, T_2 and T_3 are the estimators used to estimate mean value μ ,

where, $T_1 = x_1 + x_2 - x_3$; $T_2 = 2x_1 + 3x_3 - 4x_2$ and $T_3 = \frac{1}{3}(\lambda x_1 + x_2 + x_3) / 3$

- (i) Are T_1 and T_2 unbiased estimators?
 (ii) Find the value of λ such that T_3 is unbiased estimation for μ .
 (iii) With this value of λ is T_3 a consistent estimator?
 (iv) Which is the best estimator? (16)

13. (a) (i) Among 64 off springs of a certain cross between guinea pigs 34 were red, 10 were black and 20 were white. According to the genetic model, these numbers should be in the ratio 9:3:4. Are the data consistent with the model at 5% level? (8)

- (ii) A group of 10 rats fed on diet A and another group of 8 rats fed on a different diet B, recorded the following increase in weight.

Diet A :	5	6	8	1	12	4	3	9	6	10 gms
Diet B :	2	3	6	8	1	10	2	8	gms	

Find if the variances are significantly different. (8)

Or

- (b) The following are the number of mistakes made in 5 successive days of 4 technicians working for a photographic laboratory:-

Technician I (X_1)	Technician II (X_2)	Technician III (X_3)	Technician IV (X_4)
6	14	10	9
14	9	12	12
10	12	7	8
8	10	15	10
11	14	11	11

Test at the level of significance $\alpha = 0.01$ whether the differences among the 4 sample means can be attributed to chance. (16)

14. (a) Three varieties A, B and C of a crop are tested in a randomized block design with four replications. The plot yield in pounds are as follows.

A	6	C	5	A	8	B	9
C	8	A	4	B	6	C	9
B	7	B	6	C	10	A	6

Analyze the experimental yield and state your conclusion. (16)

Or

- (b) A variable trial was conducted on wheat with 4 varieties in a Latin square design. The plan of the experiment and the per plot yield are given below.

C	25	B	23	A	20	D	20
A	19	D	19	C	21	B	18
B	19	A	14	D	17	C	20
D	17	C	20	B	21	A	15

Analyze the data and interpret the result. (16)

15. (a) (i) Calculate 4 - yearly and 5 – yearly moving averages from the following data:

Year	1916	1917	1918	1919	1920	1921	1922
Bank Clearance	52.7	79.4	76.3	66.0	68.6	93.8	104.7
Year	1923	1924	1925	1926	1927	1928	
Bank Clearance	87.2	79.3	103.6	97.3	92.4	100	

(8)

(ii) Describe auto regressive process

(8)

Or

(b) Compute the mean squared error by exponential smoothing methods for the following data set consisting of 12 observations taken over time for $\alpha = 0.1$ and $\alpha = 0.5$.

Time	1	2	3	4	5	6	7	8	9	10	11	12
Y	71	70	69	68	64	65	72	78	75	75	75	70

(16)