

(6 pages)

OCTOBER 2011

**P/ID 17456/
RCF/PCAB**

Time : Three hours

Maximum : 75 marks

PART A — ($5 \times 5 = 25$ marks)

Answer ALL questions.

All questions carry equal marks.

1. (a) In a bolt factory, machines A , B and C manufacture 25%, 35% and 40% of the total of their output 5, 4, 2 percent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machines A , B and C .

Or

- (b) A continuous random variable X that can assume any value between $x=2$ and $x=5$ has density function given by $f(x)=k(1+x)$. Find the value of k and $p(3 < X < 4)$.

2. (a) Let X and Y have joint probability density function $f(x, y) = 2$, $0 < x < y < 1$. Find marginal density function of X and $f(Y / X = x)$.

Or

- (b) 6 coins are tossed 6400 times. Using Poisson distribution, what is the approximate probability of getting 6 heads 10 times?

3. (a) Calculate Karl Pearson's co-efficient of correlation between age and playing habits from the data given below :

Age :	20	21	22	23	24	25
No. of students :	500	400	300	240	200	160
Regular players :	400	300	180	96	60	24

Or

- (b) The regression equations are

$$2x + 3y - 8 = 0 \text{ and } x + 2y - 5 = 0.$$

Find the variance of Y given that the variance of X is 12.

4. (a) A sample of 900 members has a mean 3.4 cm and standard deviation 2.61 cm. Find the 95% confidence limits for the mean.

Or

- (b) Differentiate the following :
- (i) Null and alternative hypothesis
 - (ii) Type I and Type II errors.

5. (a) Write down the format of the ANOVA table for two factors of classification.

Or

- (b) What is time series? What are the different types of fluctuations in a time series?

PART B — (5 × 10 = 50 marks)

Answer any FIVE questions.

All questions carry equal marks.

6. Out of every 100 jobs received at a computing center, 50 are of class 1, 30 of class 2, and 20 of class 3. A sample of 30 jobs is taken with replacement.

- (a) Find the probability that the sample will contain ten jobs of each class.
- (b) Find the probability that there will be exactly twelve jobs of class 2.

7. If the density function of a continuous random variable X is given by

$$f(x) = \begin{cases} ax, & 0 \leq x \leq 1 \\ a, & 1 \leq x \leq 2 \\ 3a - ax, & 2 \leq x \leq 3 \\ 0, & \text{otherwise} \end{cases}$$

Find :

- (a) The value of ' a '
 - (b) The cumulative distribution function of X
 - (c) $P(X \leq 1.5)$.
8. The joint probability density function of the random variable (X, Y) is given by $f(x, y) = Kxye^{-(x^2+y^2)}$, $x > 0$, $y > 0$. Find the value of K and prove also that X and Y are independent.

9. The two regression lines are
 $2x + 3y = 8$ and $4x + y = 10$.
Compute \bar{x} and \bar{y} and r . Also compute σ_y when
 $\sigma_x = 2$.

10. Calculate the trend values by the method of least squares. Also calculate the sales for the years 1999 and 2000.

Year :	1991	1992	1993	1994	1995	1996	1997
Sales (in laksh) :	125	128	133	135	140	141	143

11. Define consistent and unbiased estimators. Prove that in sampling from a $N(\mu, \sigma^2)$ population the sample mean is
(a) Consistent
(b) Unbiased.
Estimator of μ .

12. Two random samples drawn from two normal populations are :
Sample I : 20 16 26 27 23 22 18 24 25 19
Sample II : 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.

13. Find the seasonal index from the following table by ratio to moving average method :

Seasons	1970	1971	1972	1973	1974
I Quarter	40	42	41	45	44
II Quarter	35	37	35	36	38
III Quarter	38	39	38	36	38
IV Quarter	40	38	42	41	42
