

(6 pages)

DECEMBER 2014

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

Time : Three hours

Maximum : 75 marks

PART A — ($5 \times 5 = 25$ marks)

Answer ALL questions.

1. (a) In 2015 there will be three candidates for the position of principal Mr. Chatterji, Mr. Ayangar and Dr. Singh – whose chances of getting the appointment are in the proportion 4 : 2 : 3 respectively. The probability that Mr. Chatterji if selected would introduce co-education in the college is 0.3. The probabilities of Mr. Ayangar and Dr. Singh doing the same are respectively 0.5 and 0.8.
 - (i) What is probability that there will be co-education in the college in 2016?
 - (ii) If there is co-education in the college in 2016, What is the probability that it was produced by factory X, Y and Z respectively?

Or

(b) A random variable X has the following probability function :

Values of X, x:	0	1	2	3	4	5	6	7
P(x):	0	k	2k	2k	3k	k ²	2k ²	7k ² + k

(i) Find k,

(ii) Evaluate $P(x < 6)$, $P(x \geq 6)$ and $P(0 < x < 5)$.

2. (a) If X is a Poisson random variable with $P(x = 1) = P(x = 2)$. Find $P(x = 4)$.

Or

(b) If $\left(\frac{2}{3} + \frac{1}{3}e^t\right)^5$ is the moment generating function of the random variable, find $P(0 \leq x \leq 2)$.

3. (a) Obtain the rank correlation coefficient for the following data :

X:	68	64	75	50	64	80	75	40	55	64
Y:	62	58	68	45	81	60	68	48	50	70

Or

(b) Regression equation are $8x - 10y + 66 = 0$ and $40x - 18y = 214$. Find the standard deviation of y when variance x = 9.

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4. (a) Explain the following terms :
- (i) Type I and Type II errors
 - (ii) Standard errors.

Or

- (b) A random sample of 500 apples was taken a large consignment and 60 were found to be bad. Obtain the 98% confidence limits for the percentage of bad apples in the consignment.
5. (a) The heights of 10 males of a given locality are found to be 70, 67, 62, 68, 61, 68, 70, 64, 64, 66 inches. Is it reasonable to believe that the average height is greater than 64 inches? Test at 5% significance level assuming that for 9 degrees of freedom $P(t > 1.83) = 0.05$.

Or

- (b) Calculate 5 yearly moving average of number of students studying in a commerce college as shown by the following figures :

Year:	1987	1988	1989	1990	1991	1992
No. of students:	14	17	22	28	25	18
Year:	1993	1994	1995	1996	1997	1998
No. of students:	20	24	25	29	30	23

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PART B — (5 × 10 = 50 marks)

Answer any FIVE questions.

6. If x and y are two random variables having joint density function :

$$f(x, y) = \begin{cases} \frac{1}{8}(6 - x - y); & 0 \leq x \leq 2, 2 \leq y < 4 \\ 0; & \text{otherwise} \end{cases}$$

Find

- (a) $P(x < 1 \cap y < 3)$
(b) $P(x + y < 3)$ and
(c) $P(x < 1 / y < 3)$.
7. Fit an exponential curve of the form $y = ab^x$ to the following data.
- | | | | | | | | | |
|----|-----|-----|-----|-----|-----|-----|-----|-----|
| X: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Y: | 1.0 | 1.2 | 1.8 | 2.5 | 3.6 | 4.7 | 6.6 | 9.1 |
8. Find the regression equation of x_1 on x_2 and x_3 given the following results :

Trait	Mean	Standard deviation	r_{12}	r_{23}	r_{31}
X_1	28.02	4.42	+0.80	—	—
X_2	4.91	1.10	—	-0.56	—
X_3	594	85	—	—	-0.40

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[P.T.O.]

9. Let $x \neq y$ have a bivariate normal distribution with parameters $\mu_1 = 3, \mu_2 = 1, \sigma_1^2 = 16, \sigma_2^2 = 25$ and $\rho = \frac{3}{5}$. Determine the following probability
- (a) $P(3 < y < 8)$
 - (b) $P(3 < y < 8/x = 7)$
 - (c) $P(-3 < x < 3)$
 - (d) $P(-3 < x < 3/y = -4)$.
10. Below are given the gain in weights (in kgs) of pigs fed on two diets A and B.

Gain in weight

Diet A : 25 32 30 34 24 14 32

Diet B : 44 34 22 10 47 31 40

Diet A : 24 30 31 35 25

Diet B : 30 32 35 18 21 35 29 22

Test if the two diets differ significantly as regards their effect on increase in weight.

11. A random sample of 10 boys has the following I.Q.'s:

70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean I.Q. of 100? Find a reasonable range in which most of the mean I.Q. values of samples of 10 boys lie.

12. Assuming that the trend is absent, determine if there is any seasonality in the data given below :

Year	I Quarter	II Quarter	III Quarter	IV Quarter
1993	3.7	4.1	3.3	3.5
1994	3.7	3.9	3.6	3.6
1995	4.0	4.1	3.3	3.1
1996	3.3	4.4	4.0	4.0

13. Perform a two way anova on the data given below

Plots of land	Treatment			
	A	B	C	D
I	38	40	41	39
II	45	42	49	36
III	40	38	42	42