*Name* : .....

*Roll No.* : .....

*Invigilator's Signature* : .....

**CS/B.Tech (TT/APM)/SEM-3/TT-307/2009-10**

# 2009
# STATISTICS

*Time Allotted* : 3 Hours | Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

## GROUP – A
## ( Multiple Choice Type Questions )

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

   i) If a constant $k$ is added to each observation of a set, the mean is

      a) increased by $k$

      b) decreased by $k$

      c) $k$ times the original mean

      d) not affected.

   ii) Which of the following represents median ?

      a) First quartile  b) Fifth percentile

      c) Sixth decile  d) None of these.

iii) The correct relationship between A.M., G.M. and H.M. is

a) A.M. = G.M. = H.M. b) G.M. ≥ A.M. ≥ H.M.

c) H.M. ≥ G.M. ≥ A.M. d) A.M. ≥ G.M. ≥ H.M.

iv) Sum of the deviations about mean is

a) zero b) minimum

c) maximum d) one.

v) Sum of the squares of the deviations about mean is

a) maximum b) minimum

c) zero d) none of these.

vi) The probability that a leap year selected at random will contain 53 Wednesdays and 53 Thursdays is

a) $\frac{3}{4}$ b) $\frac{1}{7}$

c) $\frac{2}{7}$ d) $\frac{3}{8}$.

vii) If a simple random sample of size 2 is drawn without replacement from population of size 10, the total number of possible samples is

a) 90 b) 45

c) 20 d) none of these.

viii) If the two regression coefficients are $b_{xy} = -1{\cdot}2$ and $b_{yx} = -0{\cdot}3$, the correlation coefficient between $x$ and $y$ is

a) 0·36 b) 0·6

c) – 0·6 d) none of these.

ix) If two events $A$ and $B$ are such that $A$ is subset of $B$ and vice versa, the relation between $P(A)$ and $P(B)$ is

a) $P(A) \geq P(B)$ b) $P(A) \leq P(B)$

c) $P(A) = P(B)$ d) none of these.

x) If $A$ is subset of $B$, then $P(A/B)$ is equal to

a) zero b) one

c) $P(A) / P(B)$ d) $P(B) / P(A)$.

## GROUP – B
## ( Short Answer Type Questions )

Answer any *three* of the following. $3 \times 5 = 15$

2. Find the median of the following data :

| ***Marks*** | Less than 40 | 41 – 50 | 51 – 60 | 61 – 70 | 71 – 80 | 81 and above |
|---|---|---|---|---|---|---|
| ***No. of students*** | 10 | 20 | 15 | 25 | 10 | 20 |

3. The probability that a student Mr. $X$ passed Mathematics is 2/3, the probability that he passes Statistics is 4/9. If the probability of passing at least one subeject is 4/5, what is the probability that Mr. $X$ will pass both the subjects ?

4. The population of Cyprus is 75% Greek, 25% Turkish ; 20% of the Greeks and 10% of the Turks speak English. A visitor to the town meets someone who speaks English. What is the probability that he is Greek ?

5. A continuous random variable $X$ has the probability density function :

$$f(x) = \frac{1}{2} - ax, \quad 0 \le X \le 4$$

$$= 0 \qquad \text{elsewhere}$$

Find :

i) value of $a$

ii) mean of $X$

iii) $P(2X + 3 > 5)$.

6. Obtain the mean and variance of the Binomial distribution with parameters $n$ and $p$.

## GROUP – C
### ( Long Answer Type Questions )

Answer any *three* of the following. $3 \times 15 = 45$

7. A factory produces two types of electric bulbs $A$ and $B$. In an experiment relating their life the following results were obtained :

| ***Length of Life ( in hours )*** | ***No. of bulbs*** | |
|---|---|---|
| | ***A*** | ***B*** |
| 500 – 700 | 5 | 4 |
| 700 – 900 | 11 | 30 |
| 900 – 1100 | 26 | 12 |
| 1100 – 1300 | 10 | 8 |
| 1300 – 1500 | 8 | 6 |

Find which type of bulbs less varies in length of life.

8. Calculate the correlation coefficient and the lines of regression from the following data :

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ***X*** | 100 | 98 | 78 | 85 | 110 | 93 | 80 |
| ***Y*** | 85 | 90 | 70 | 72 | 95 | 81 | 74 |

Find the value of $y$ when $x = 82$.

9. a) In a large institution 2·28% of employees receive income below Rs. 4,500 and 15·87% of employees receive income above Rs. 7,500 per month. Assuming the income follows normal distribution, find the mean and standard deviation of the distribution

[ $\phi(-2) = 0{\cdot}4772$, $\phi(1) = 0{\cdot}3413$ ].

b) If 4 of 12 scooterists do not carry driving licence, what is the probability that a traffic inspector randomly selects 4 scooterists, will catch

i) 1 for not carrying driving licence

ii) at least 2 for not carrying driving licence ? 8 + 7

10. a) A random variable $X$ follows binomial distribution with mean $\frac{5}{3}$ and $P(X = 2) = P(X = 1)$. Find variance of $X$, $P(X \geq 1)$ and $P(X \leq 1)$.

b) There are two identical boxes containing respectively 4 white and 3 red balls, and 3 white and 7 red balls. A box is chosen at random and a ball is drawn from it. Find the probability that the ball is white. If the ball is white, what is the probability that it has come from the first box ?

c) The probability that an individual suffers from a bad reaction from an injection is 0·001. What is the probability that out of 3000 individuals exactly 3 individuals will suffer from a bad reaction ?

$\left[e^{-3} = 0 \cdot 0489\right]$. 6 + 6 + 3

11. a) The scores made by two batsmen, *A* and *B* in recent ten one-day cricket matches are given below :

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ***A :*** | 30 | 44 | 15 | 90 | 0 | 2 | 78 | 88 | 6 | 15 |
| ***B :*** | 21 | 26 | 58 | 5 | 19 | 43 | 26 | 51 | 36 | 36 |

Calculate mean and standard deviation of runs scored for each batsman. Which batsman may be said to be more consistent ?

b) Obtain the maximum likelihood estimates of the parameter of the binomial distribution ( *N, P* ) for *n* sample values. 7 + 8