



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.OPTM/SEM-6/BO-603/2012**  
**2012**  
**BIO-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 any *ten* of the following :  
 $10 \times 1 = 10$

- i) The mode of the observations 4, 6, 8, 6, 5, 6, 7, 4, 5, 6, 7, 7 is
- |      |                   |
|------|-------------------|
| a) 7 | b) 6              |
| c) 5 | d) none of these. |
- ii) The HM of 2, 4, 6, 8, 10 is
- |         |          |
|---------|----------|
| a) 4.4  | b) 6.8   |
| c) 7.11 | d) 10.5. |

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[ Turn over



- iii) The normal curve is perfectly symmetrical about the
- a) mean
  - b) median
  - c) mode
  - d) none of these.
- iv) In which of the following distributions the mean and variance are same ?
- a) Binomial
  - b) Poisson
  - c) Uniform
  - d) Normal.
- v) The graphical representation of a cumulative frequency distribution is known as
- a) Mean curve
  - b) Histogram
  - c) Ogive
  - d) Bar chart.
- vi) If  $A$  and  $B$  are mutually exclusive events, then
- a)  $P ( AB ) = P ( A ) P ( B | A )$
  - b)  $P ( A ) + P ( B ) = 1$
  - c)  $P ( AB ) = P ( B ) P ( A | B )$
  - d) all of these.
- vii) If  $X, Y$  are jointly distributed random variables, then
- a)  $\text{Var} ( X, Y ) = \text{Var} ( X ) + \text{Var} ( Y ) + 2 \text{Cov} ( X, Y )$
  - b)  $\text{Var} ( X, Y ) = \text{Var} ( X ) + \text{Var} ( Y ) - \text{Cov} ( X, Y )$
  - c)  $\text{Var} ( X, Y ) = \text{Var} ( X ) + \text{Var} ( Y ) + \text{Cov} ( X, Y )$
  - d)  $\text{Var} ( X, Y ) = \text{Var} ( X ) + \text{Var} ( Y ) - 2 \text{Cov} ( X, Y )$ .



viii) If the variables  $X, Y$  are independent, then

- a)  $\text{cov} ( X, Y ) = 0$                       b)  $\text{cov} ( X, Y ) = 1$   
 c)  $\text{cov} ( X, Y ) = - 1$                       d) all of these.

ix) Standard error of sample means ( $\bar{x}$ ) is

- a)  $\sigma/\sqrt{n}$                                       b)  $\sqrt{n}/\sigma$   
 c)  $\sigma/n$     d) none of these.

x) If the regression coefficients are 4 and 16, then the correlation coefficient is

- a) 8    b) 12  
 c) 24    d) 10.

xi) The standard deviation is independent of the change of

- a) origin    b) scale  
 c) both (a) and (b)                            d) none of these.

xii) A pair of dice is thrown, the chance of obtaining a sum of 12 is

- a)  $\frac{1}{12}$     b)  $\frac{5}{12}$   
 c)  $\frac{3}{12}$     d)  $\frac{7}{12}$ .

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xiii) If  $Q_1, Q_2, Q_3$  are 1st, 2nd and 3rd quartiles respectively, then which of the following is true ?

- a)  $Q_1 < Q_2 < Q_3$
- b)  $Q_1 = Q_2 < Q_3$
- c)  $Q_1 < Q_2 = Q_3$
- d)  $Q_1 > Q_2 > Q_3$

xiv) Poisson distribution is

- a) Discrete
- b) Continuous
- c) Uniform
- d) none of these.

xv) The median of 2, 7, 9, 4, 12, 5, 13, 8, 23 is

- a) 7
- b) 8
- c) 7.5
- d) 8.5.

**GROUP - B**

**( Short Answer Type Questions )**

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

2. The mean of optometry students is 28.8. Find the missing frequency :

|                  |        |         |         |         |         |         |
|------------------|--------|---------|---------|---------|---------|---------|
| <b>Class</b>     | 0 - 10 | 10 - 20 | 20 - 30 | 30 - 40 | 40 - 50 | 50 - 60 |
| <b>Frequency</b> | 4      | 6       | 20      | ?       | 7       | 3       |

3. A sample of size 60 has mean 52 and standard deviation 9. Another sample of size 90 has mean 48 and standard deviation 12. If two samples are pooled together, find the mean and the standard deviation of combined samples.

4. Find the mode of the following :

|                          |    |    |    |    |    |     |
|--------------------------|----|----|----|----|----|-----|
| <b>Year under</b>        | 10 | 20 | 30 | 40 | 50 | 60  |
| <b>Number of persons</b> | 15 | 32 | 51 | 78 | 97 | 109 |



5. Find the rank correlation coefficient of the given data :

| <b>Students</b>             | <b>A</b> | <b>B</b> | <b>C</b> | <b>D</b> | <b>E</b> | <b>F</b> | <b>G</b> |
|-----------------------------|----------|----------|----------|----------|----------|----------|----------|
| <b>Marks in Mathematics</b> | 96       | 85       | 64       | 32       | 48       | 49       | 56       |
| <b>Marks in Physics</b>     | 32       | 45       | 55       | 59       | 67       | 68       | 91       |

6. Four coins are tossed simultaneously. What is the probability of getting at least 2 heads ?

**GROUP - C**

**( Long Answer Type Questions )**

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

7. a) Two persons  $X$  and  $Y$  appear in an interview for two vacancies in the post of Faculty of optometry. The probability of  $X$ 's selection is  $1/5$  and that of  $Y$ 's selection is  $1/3$ , what is the probability that

- i) only one of them selected,
- ii) none of them selected ?

b) Find composite standard deviation  $\sigma$  from the following table :

| Characteristics     | Groups I          | Groups II          | Composite Group |
|---------------------|-------------------|--------------------|-----------------|
| No. of observations | $N_1 = 55$        | $N_2 = 45$         | $N = 100$       |
| mean                | $\bar{X}_1 = 6.6$ | $\bar{X}_2 = 6.38$ | $\bar{X} = 6.5$ |
| Standard Deviation  | $\sigma_1 = 1.5$  | $\sigma_2 = 1.97$  | $\sigma = ?$    |

8 + 7

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8. a) Draw the histogram, frequency polygon and ogives ( both less than and more than types ) :

|                  |         |         |         |         |         |           |           |
|------------------|---------|---------|---------|---------|---------|-----------|-----------|
| Wages            | 50 - 59 | 60 - 69 | 70 - 79 | 80 - 89 | 90 - 99 | 100 - 109 | 110 - 119 |
| No. of Employees | 8       | 10      | 16      | 14      | 10      | 5         | 2         |

b) Find median from the following :

|                  |           |           |           |           |           |
|------------------|-----------|-----------|-----------|-----------|-----------|
| <b>Income :</b>  | 260 - 269 | 270 - 279 | 280 - 289 | 290 - 299 | 300 - 309 |
| <b>Workers :</b> | 6         | 14        | 29        | 23        | 16        |

|           |           |
|-----------|-----------|
| 310 - 319 | 320 - 329 |
| 10        | 2         |

10 + 5

9. a) A population consists of the number 1, 5, 3, 7, 9. Consider all possible samples of size two which can be drawn with replacement from this population. Find

- i) Population mean
- ii) Population s.d.
- iii) Mean of sampling distribution of means
- iv) s.d. of the sampling distribution of means
- v) Standard error of means.

b) If  $P(A) = 1/2$ ,  $P(B) = 3/5$ ,  $P(A \cap B) = 1/3$ , find  $P(A \cup B)$  &  $P(A/B)$ . 10 + 5

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10. Find the three quartiles  $Q_1, Q_2, Q_3$  from given data :

|                       |         |         |         |         |         |         |
|-----------------------|---------|---------|---------|---------|---------|---------|
| <b>Class Interval</b> | 10 - 15 | 15 - 20 | 20 - 25 | 25 - 30 | 30 - 40 | 40 - 50 |
| <b>Frequencny</b>     | 4       | 12      | 16      | 22      | 10      | 8       |

|         |         |       |
|---------|---------|-------|
| 50 - 60 | 60 - 70 | Total |
| 6       | 4       | 82    |

Find also the quartile deviation.

11. a) Arithmetic mean and standard deviation of a binomial distribution are 4 and  $2\sqrt{2}/3$  respectively. Find the values of  $p$  and  $q$ .
- b) Given  $\Sigma x = 56, \Sigma y = 40, \Sigma xy = 364, \Sigma x^2 = 524, \Sigma y^2 = 256$ , and  $n = 8$ . Find the regression equation of  $x$  on  $y$ .
- c) If the Geometric mean of 4, 6,  $x$ , 3, 6, 12, is 5.7, then find the value of  $x$ .

$$5 + 7 + 3$$

