UG–448 **BMS–22**

B.Sc. DEGREE EXAMINATION – DECEMBER 2018.

Second Year

Mathematics

STATISTICS AND MECHANICS

Time : 3 hours Maximum marks : 75

SECTION A — ($5 \times 5 = 25$ marks)

Answer any FIVE questions.

1. The geometric mean of 10 observations was calculated as 28.6. It was later discovered that one of the observations was recorded as 23.4 instead of 32.4. calculate the correct geometric mean.

2. Fit a straight line to the following data (0,12), (5,15), (10,17), (15,22), (20,24), (25,30) where the first component represents x-values and second component represents y-values.

3. Prove that correlation coefficient lies between –1 and +1.

4. Out of 500 literates in a certain village, the number of criminals was 10 while in another village, out of 7200 illiterates, the number of criminals was 120. Is there any association between illiteracy and criminality on the basis of above figures?

5. Define time series. Write short notes on components of time series.

6. State and prove Chebyshev inequality.

7. A random sample of 27 pairs of observations from a normal population gives a correlation coefficient 0.42. Is it likely that the variables in the population are uncorrelated?

8. A ball dropped from a height h on a horizontal plane bounces up and down. If the coefficient of restitution is e, prove that the whole distance H covered before it comes to rest is $h\frac{1+e^2}{1-e^2}$.

SECTION B — (5 × 10 = 50 marks)

Answer any FIVE questions.

9. Fit a parabola to the following data:

X:	20	40	60	80	100	120
Y:	5.5	9.1	14.9	22.8	33.3	46.0

10. From the following data obtain two liens of regression and hence find the coefficient of correlation:

X:	6	2	10	4	8
Y:	9	11	5	8	7

11. In 1986 there were three candidates for the position of principal - Dr. Jaya, Dr. Sankar and Dr. Lakshmi – whose chances of getting the appointment are in proportion 4:2:3 respectively. The probability that Dr. Jaya if selected would introduce coeducation in the college is 0.3. The probabilities of Dr. Sankar and Dr. Lakshmi doing the same are respective 0.5 and 0.8. what is the probability that there was coeducation in the college in 1987?

12. A random sample of size 16 has 53 as mean. The sum of the squares of the deviations taken from mean is 135. Can this sample be regarded as taken from the population having 56 as mean? Obtain 95% and 99% confidence limits of the mean of the population.

13. A point P describes an equiangular spiral $r = a\, e^{\theta \cot \alpha}$ (where a and α are constants), with constant angular velocity about the pole O. Show that its acceleration varies as OP and is in a direction making with the tangent at P the same constant angle that OP makes.

14. Define Poisson distribution. Find the moment generating function and hence or otherwise find the mean and variance of Poisson distribution.

15. Fit a polynomial of degree four which takes the values (2,0), (4,0), (6,1), (8,0), (10,0), where the first component stands for x and second component stands for y.

16. The diameter of an electric cable, say X, is assumed to be a continuous random variable with probability density function $f(x) = 6x(1-x),\ 0 \le x \le 1$

    (a) Check that $f(x)$ is probability density function

    (b) Determine 'a' and 'b' such that $P(X < b) = P(X > b)$.

———————