

AEROBE

TIME : 2 hrs.

MARK : 50

- Instruction :** 1) Attempt all questions.
2) Figures to the right indicate marks.
3) Use of calculator is allowed.
4) Statistical tables will be provided. on request

- Q.1 a) Define for a continuous random variable
i) Cumulative distribution function
Also state its properties.
ii) Mean and variance. 06
- b) For a continuous random variable
$$f(x) = kx \quad 0 < x < 2$$
$$= 0 \quad \text{otherwise}$$

Finds K, mean and standard deviation of x. 06

OR

- Q.1 a) Define an exponential distribution with parameter λ . Find its mean. 06
b) The demand of cakes (in kg) at a bakery shows Rectangular distribution in (1000, 1500).
Find the probability that on a certain day the demand would be (i) at least 1200 kg
(ii) between 1100 kg and 1450 kg. (iii) at most 1400 kg. 06
- Q.2 a) Define a standard normal variate and state its important properties. 06
b) If the marks in a particular subject are assumed to be normal distribution with mean 40
and variance 9. Find how many out of 1000 students get marks (i) below 35
(ii) between 43 and 46 (iii) above 46. 06

OR

- Q.2 a) Explain the concept of
i) Sampling distribution of mean.
ii) Point estimation and interval estimation. 06
b) A large population has a mean height of 150cm and standard deviation of 20cm. A random
sample of size 100 is taken from this population find the probability that the sample mean
will exceed (i) 151 cm. (ii) lie between 148 cm. and 155 cm. (Assume that the
population of height is normal and sampling is with replacement.) 06
- Q.3 a) Explain the following terms :-
i) Null and alternative hypothesis
ii) Type I and Type II error.
iii) Critical region. 06
b) A Pharmaceutical firm maintains that the mean time for a drug to show effect is 24
minutes. In a sample of 400 trials the mean time is 26 minutes with a standard deviation
of 4 minutes. Test the hypothesis that the mean time is 24 minutes against the alternative
that it is not equal to 24 minutes. Use 5% level of significance. 06

OR

- Q.3 a) Explain how will you arrive at the best decision criterion based on a large sample to test
the hypothesis $H_0 : P_1 = P_2$ against alternative hypothesis $H_1 : P_1 > P_2$, where P_1 and P_2 ,

- Q.4 a) State the applications of chi-square distribution. Also state the important properties of chi-square distribution.
- b) The following table shows the result of inoculation against cholera.

	Not attacked	attacked.
inoculated	95	5
Not-inoculated	75	25

can we say at 5% level of significance that inoculation is effective in controlling susceptibility to cholera?

OR

- Q.4 a) Define chi-square variate with n degrees of freedom and prove for 2 x 2 contingency

a	b
c	d

$$\chi^2 = \frac{N(ad - bc)^2}{(a + b)(c + d)(a + c)(b + d)}$$

- b) Children having one parent of blood type M and other type N will always be one of the three types M, MN, N and the average proportion of these will be 1 : 2 : 1. out of 300 children having one type M, 45% of type MN and the remaining of type N. Use χ^2 to test the hypothesis at 5% level of significance.

