

- N.B. :-**
- 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)** If X follows rectangular distribution in interval (a, b). Write down probability density function of X. Hence obtain its mean and variance. 6

b) Suppose the number of minutes a typist spends during an eight hour day for non - productive activities has the p.d.f.

$$f(x) = \frac{K}{x^3} \quad x \geq 30$$

$$= 0 \quad \text{Otherwise}$$

Find i) K ii) Determine the probability that on a certain day she washes atmost 40 minutes of her working period.  $P [ x \leq 40 ]$

**OR**

**Q.1 a)** Define a random variable X following exponential distribution with parameter  $\lambda$ . Also find its cumulative distribution state mean and variance of exponential distribution. 6

b) X is a continuous random variable with p.d.f.

$$f(x) = \frac{k}{x^2} \quad x \geq 100$$

$$= 0 \quad x < 100$$

Find i) K ii)  $P (X < 150)$

**Q.2 a)** State properties of normal distribution with parameters  $\mu, \sigma$ . 6

b) If the marks in a particular subject are assumed to follow 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.

(Given Area under standard normal curve between ordinates  $Z = 0, Z = 1.66$  is 0.4215 between  $Z = 0, Z = 1$  is 0.3413 between  $Z = 0, Z = 2$  is 0.4772)

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**OR**

**Q.2 a)** Explain the concept of i) Statistics ii) parameter iii) estimator 6

b) The mean life of a large lot of fluorescent tube is 1570 hours with a standard deviation of 150 hours. A sample of 100 tubes is drawn from it with replacement. Find the probability that mean life of these tubes will

i) exceed 1600 hours.

ii) not exceed 1540 hours iii) we between 1550 hours and 1600 hours. 8

**Q.3 a)** Explain the following terms. 6

i) Null hypothesis and alternative hypothesis

ii) Critical region

iii) Type I, Type II errors. 6

- b) A bag contains 3 balls of which ( $m > 0$ ) are white. To test  $H_0 : m \leq 2$  one ball is drawn at random from the bag and  $H_0$  is rejected if the ball drawn is white. Find
- i) The level of significance for the test
  - ii) Probability of type II error.
- 7

**OR**

- Q.3** a) Explain the concept of estimation. Distinguish between estimate and estimator. 6
- b) A survey of 36 retired people revealed the mean age at which their income was maximum to be 47 years with a standard deviation of 7.2 years. Find 95% confidence interval for the mean age of maximum earning of people who survive till they retire. Also test hypothesis that mean age of retirement is 50 years for the above data at 5% level of significance. 7

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

a	b
c	d

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

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- b) 1600 families were selected at random in a city to test the belief that high income families usually send their children to public school, and low income families often send their children to government school. The following results were obtained. To test whether income and type of school are independent.

	School		
Income	Public	Govt.	Total
High	494	506	1000
Low	162	438	600
Total	656	944	1600

( $\chi^2$  with 1 d.f. at 5% is 3.84) 6

**OR**

- Q.4** a) Explain how would you arrive at the best decision criterion based on a large sample to test the hypothesis  $H_0 : \mu = \mu_0$  against  $H_1 : \mu > \mu_0$  where  $\mu_0$  is specified constant and  $\mu$  is the mean of population under consideration if you use 5% level of significance. 6
- b) An advertisement firm claims that 20% of all TV viewers watch a specific T.V. programme. In a random sample of 1000 viewers only 184 were found to be watching this T.V. programme . Test at 5% level of significance whether this is sufficient evidence to dismiss advertiser's claim. 7