

**M.Sc., MEDICAL PHYSICS DEGREE EXAMINATION
FIRST YEAR
PAPER II – RADIOLOGICAL MATHEMATICS**

Q.P. Code : 284012

Time : Three hours

Maximum : 100 Marks

I. Elaborate on :

(2 x 20 = 40)

1. a) A package contains 50 similar components and inspection shows that four have been damaged during transit. If six components are drawn at random from the contents of the package determine the probabilities that in this sample (a) one and (b) less than three are damaged.
- b) The probability of a person having an accident in a certain period of time is 0.0003. For a population of 7500 people, draw a histogram showing the probabilities of 0, 1, 2, 3, 4, 5 and 6 people having an accident in this period.
2. a) Define the laws of probability.
- b) The probability of a component failing in one year due to excessive temperature is $1/20$, due to excessive vibration is $1/25$ and due to excessive humidity is $1/50$. Determine the probabilities that during a one-year period a component: (a) fails due to excessive temperature and excessive vibration, (b) fails due to excessive vibration or excessive humidity, and (c) will not fail because of both excessive temperature and excessive humidity.

II. Write notes on:

(10 x 6 = 60)

1. Simpson's rule.
2. Use the trapezoidal rule to evaluate, $\int_0^{\frac{\pi}{2}} \frac{1}{1 + \sin x} dx$, using 6 intervals. Give the answer correct to 4 significant figures.
3. Determine the standard deviation from the mean of the set of numbers: {35, 22, 25, 23, 28, 33, 30} correct to 3 significant figures.
4. Simpson's eighth rule.
5. Euler's method.
6. Solve the equation: $\frac{1}{2} \log 4 = \log x$.
7. Properties of arithmetic mean.
8. Round-off error.
9. Law of large number.
10. Standard error and variance.
