

[LL 1017]

OCTOBER 2017

Sub. Code: 4012

**M.Sc. MEDICAL PHYSICS EXAMS  
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) Derive Newton-Raphson formula to find the actual root of an equation  $f(x) = 0$ .  
b) Using Newton-Raphson iteration method show that the root of the equation  $X \sin X + \cos X = 0$  is 2.7984. The initial value of X is 3.14.
2. a) Discuss the assumptions of Karl-Pearson correlation method.  
b) Find the Karl-Pearson correlation coefficient for the following data:

|   |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|
| X | 40  | 45  | 48  | 50  | 55  | 50  | 54  | 58  |
| Y | 120 | 125 | 130 | 125 | 140 | 146 | 154 | 160 |

**II. Write notes on:**

**(10 x 6 = 60)**

1. Define Accuracy and Precision and give an example for each. Find the sum of  $0.1874 \times 10^4$  and  $27.8 \times 10^{-1}$ . Obtain its round off and truncating approximation in 4 digits mantissa.
2. Calculate the decay constant for cobalt-60 ( $T_{1/2} = 5.26$  yrs) in units of  $\text{month}^{-1}$ .
3. Solve the differential equation  $dy/dx = -xy$  for  $y(x=0) = 1$  using Picard's method. Perform three iterations.
4. Discuss Binomial distribution.
5. Use Euler's method with  $h = 0.5$  to solve initial value problem  $dy/dx = yx^2 - 1.1y$  for  $x = 0$  to 1 with  $y(0) = 1$ .
6. Solve  $f(x) = \int_{200}^{1000} \frac{1}{\log x} dx$  by eight intervals using Simpson's 1/3 rule.
7. Discuss Systematic random sampling.
8. The values of capacitances in  $\mu\text{F}$  of ten capacitors selected at random from a large batch of similar capacitors are: 34.3, 25.0, 30.4, 34.6, 29.6, 28.7, 33.4, 32.7, 29.0 and 31.3. Determine the standard deviation from the mean for these capacitors.
9. State the properties and applications of t- distribution.
10. Signal-to-noise ratio.

\*\*\*\*\*