

**U.G. 4th Semester Examinations 2022****MATHEMATICS (General)****Paper Code : DC-4****(NUMERICAL METHODS & PROBABILITY THEORY)****[CBCS]**

Full Marks : 32

Time : Two Hours

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.***Group - A**1. Answer any **four** questions :

1×4=4

- (a) If  $A$  and  $B$  are two events such that  $P(A) = P(B) = 1$ , show that  $P(A + B) = 1$  and  $P(AB) = 1$ .
- (b) If  $X$  is a random variable, prove that  $V(aX + b) = a^2V(X)$ .
- (c) If  $A$  and  $B$  are independent events, prove that  $A^c$  and  $B^c$  are also independent.
- (d) Find the number of significant figures in 1.0010.
- (e) Find the percentage error in approximate representation of  $\frac{4}{3}$  by 1.33.
- (f) Find  $(\nabla + \Delta)(x^2)$ , where  $h = 1$ .
- (g) When do you use Newton's forward interpolation formula in finding the functional value at a given point?

**Group - B**Answer any **two** questions.

5×2=10

2. (a) Find the probability that in a game of bridge, a hand of 13 cards will contain atleast one ace. 3
- (b) A coin is tossed 3 times in succession. Find the probability of exactly 2 heads. 2

[P.T.O.]

3. State and prove Baye's theorem. 5

4. Given

$$x \quad : \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8$$

$$f(x) : \quad 1 \quad 8 \quad 27 \quad 64 \quad 125 \quad 216 \quad 343 \quad 512$$

Find  $f(1.5)$  by using suitable interpolation formula. 5

5. Solve by Euler's Method, the following differential equation for  $x = 1$  by taking  $h = 0.2$ .

$$\frac{dy}{dx} = x + y, \quad y(0) = 1 \quad \text{5}$$

### Group - C

Answer any *two* questions. 9×2=18

6. (a) Determine the value of the constant  $C$  such that  $f(x)$  defined by

$$f(x) = \begin{cases} Cx(1-x) & \text{if } 0 < x < 1, \\ 0 & \text{elsewhere} \end{cases}$$

is a probability density function. Find the corresponding distribution function and

$$P\left(x > \frac{1}{3}\right). \quad \text{5}$$

(b) Let  $X$  be a random variable with the following probability distribution :

$$x \quad : \quad -3 \quad 6 \quad 9$$

$$p(X = x) \quad : \quad \frac{1}{6} \quad \frac{1}{2} \quad \frac{1}{3}$$

Find  $E(X)$  and  $\text{Var}(X)$ . 4

7. (a) A radio active source emits on the average 2.5 particles per second. Calculate the probability that 3 or more particles will be emitted in an interval of 4 seconds. 4

(b) Find a positive real root of  $x^2 + 2x + 2 = 0$ , by Newton-Raphson Method. 5

8. (a) Evaluate  $\int_0^1 \frac{dx}{1+x}$  by using Simpson's  $\frac{1}{3}$ rd rule with  $h = 0.25$ . 5

(b) Find the cubic polynomial which takes the following values : 4

$x$	0	1	2	3
$f(x)$	1	2	1	10