

# Question Paper

Exam Date & Time: 26-Jul-2022 (10:00 AM - 01:00 PM)



## MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST SEMESTER B.Sc. RADIOTHERAPY TECHNOLOGY DEGREE EXAMINATION - JULY 2022  
SUBJECT: BRTT 103 - BASIC AND APPLIED MATHEMATICS  
(2016 RV SCHEME)

Marks: 100

Duration: 180 mins.

Answer all the questions.

- 1A) Define Exponential and Constant function. Give an example. (2)
- 1B) Define Null set and give an example. (2)
- 1C) Solve by quadratic formula:  $x^2 - 7x + 12 = 0$ . (2)
- 1D) State Lagrange's Mean Value theorem and give an example. (2)
- 1E) Draw the graph of  $y = \tan x$ . (2)
- 2A) Solve  $\frac{dy}{dx} = \frac{x-2y+3}{x-2y+5}$ , when  $x=2, y=-1$ . (5)
- 2B) Integrate with respect to  $x$ : i)  $\frac{1}{1+\sin x}$  ii)  $\sqrt{1 + \cos 2x}$ . (5)
- 2C) Differentiate: a)  $y = e^x \log x$  b)  $y = \sec x + e^x - 3$ , with respect  $x$ . (5)
- 2D) Using Venn diagram prove that  $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ . (5)
- 2E) Evaluate: i)  $\frac{5 \cos^2 60^\circ + 4 \sec^2 30^\circ - \tan^2 45^\circ}{\sin^2 30^\circ + \cos^2 30^\circ}$ , : ii)  $\frac{\cos 45^\circ}{\sec 30^\circ + \operatorname{cosec} 30^\circ}$ . (5)
- 2F) Solve the quadratic equation using the formula (5)  
a)  $3x^2 + 2x - 7 = 0$ , b)  $x^2 - 2x + 1 = 0$ .
- 3) i) Integrate the following function with respect to  $x$ :  $\frac{\sin x + \cos x}{\sqrt{1 + \sin 2x}}$ . (10)  
ii) Prove that i)  $\frac{\operatorname{cosec}^2 x - 1}{\operatorname{cosec}^2 x}$  ii)  $\frac{\cot x - 1}{\cot x + 1} = \frac{1 - \tan x}{1 + \tan x}$ .
- 4) i) Solve  $\frac{dy}{dx} = (4x + y + 1)^2$ , When  $x=0, y=\frac{1}{2}$ . (10)  
ii) Find  $y'$ , given  $y = \frac{x^2 \cos x + 1}{x \sin x + x^2}$ .
- 5A) (4)

Using BODMAS rule simplify:

a)  $-(3^2 \div 2 - 1 \div 4) \div (5 \div 2^2)$ .

b)  $(14 - 3^2) \times (1 \div 2) \times (-4 - 2 \times 3^2)$ .

5B) Let  $A = \{x; 1 < x < 3\}$ ,  $B = \{x; 5 \leq x \leq 7\}$ ,  $C = \{x; 2 < x < 6\}$ . (4)

Find  $A \cup C$ ,  $(A \cup B) \cup C$  and  $B \cap \bar{C}$ .

5C) Using First principle find the differentiation of  $y = \cos x$ . (4)

5D) Savithri had to make a model of a cylindrical kaleidoscope for her science project. She wanted to use chart paper to make the curved surface of the kaleidoscope. What would be the area of chart paper required by her, if she wanted to make a kaleidoscope of length 25cm with a 3.5 cm radius? (4)

5E) Solve by method of separation of variables:  $\frac{dy}{dx} = \frac{x(2 \log x + 1)}{\sin y + y \cos y}$ . (4)

6A) Show that  $\frac{1 + \sin x}{1 - \sin x} - \frac{1 - \sin x}{1 + \sin x} = 4 \tan x \sec x$ . (4)

6B) Integrate with respect to x: i)  $\frac{x^5 + 3x^2 - 4x}{x^7}$  ii)  $\frac{1 - \cos x}{\sin x}$ . (4)

6C) The height of a cone is 16cm and its base radius is 12cm. Find the curved surface area and total surface area of cone. (4)

6D) Solve the simultaneous equations by method of substitution, (4)

a)  $2x - y = 3$ ,  $3x + 2y = 8$  and b)  $7x + 2y = 47$ ,  $5x - 4y = 1$ .

6E) Solve simultaneous equations graphically  $y = 3x - 2$ ,  $y = -x + 6$ . (4)

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