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BEY-019

**BACHELOR OF SCIENCE (APPLIED
SCIENCE-ENERGY) (BSCAEY)**

Term-End Examination

June, 2026

**BEY-019 : REAL ANALYSIS AND DISCRETE
MATHEMATICS**

Time : 3 Hours

Maximum Marks : 70

Note : (i) *Question No. 1 is compulsory.*

(ii) *Attempt any **six** questions from the remaining questions 2 to 9.*

(iii) *Use of scientific (non-programmable) calculator is allowed in the exam.*

(iv) *Symbols have their usual meanings.*

1. State whether the following statements are True or False. Justify your answer with a short proof or a counter example. $5 \times 2 = 10$

(a) $p \rightarrow q$ and $\sim p \wedge q$ are equivalent statements.

- (b) $2x^2 + 2y^2 - 16x - 20y + 64 = 0$ is a circle.
 - (c) $\sin x$ is an even function.
 - (d) The real function $f(x) = x^2$ is an injective function.
 - (e) The relation of divisibility in $\mathbb{N}$ is symmetric relation.
2. (a) In a survey, it is found that 23 people like product A, 26 people like product B and 29 people like product C. If 14 people like products A and B, 15 people like products B and C, 12 people like products C and A and 8 people like all three products. Find : 6
- (i) How many people are surveyed in all ?
 - (ii) How many people like product A only ?
- (b) Show that the relation R is the set $\mathbb{Z}$ of integers given by :
- $$R = \{(a, b) : 2 \text{ divides } a - b\}$$
- is an equivalence relation. 4

3. (a) The relation f is defined as :

$$f(x) = \begin{cases} x^2, & 0 \leq x \leq 2 \\ 3x, & 2 \leq x \leq 10 \end{cases}$$

Check, whether f is a function or not.
Justify your answer. 5

- (b) Find the domain of the function : 5

$$f(x) = \frac{x^2 + 3x + 5}{x^2 - 5x + 4}$$

4. (a) Line through the points $(-2, 6)$ and $(4, 8)$ is perpendicular to the line through the points $(8, 12)$ and $(x, 24)$.
Find the value of x . 5

- (b) Write the equation of a parabola with focus $(3, 2)$ and directrix $x = -1$, by using definition. 5

5. (a) Find the tenth term of a geometric progression whose third term is 16 and seventh term is 1. 5

- (b) Bharat Electric Company had sales of ₹ 2,00,000 in its first year of operations. If the sales increased by ₹ 30,000 per year thereafter, find company's sales in the fifth year and its total sales over the first five years of operations. 5

6. (a) Explain the concept of quantifiers. With the help of examples show the difference between different types of quantifiers. 5

- (b) Solve the following linear difference equation by iterative method : 5

$$y_{t+1} - 6y_t = 0$$

7. (a) Find $\frac{d^3 y}{dx^3}$ for $y = (2x + 3)^7$. 5

- (b) Find local maxima and local minima for the function : 5

$$f(x) = 2x^3 - 15x^2 + 36x + 9$$

8. (a) Evaluate $\int \frac{2x+1}{(x^2+x+7)^5} dx$. 5

- (b) Evaluate $\int_2^3 \frac{\sqrt{x}}{\sqrt{x} + \sqrt{5-x}} dx$ 5

9. (a) Show that $f(x) = |x|$ is not differentiable at $x = 0$. 5

- (b) Evaluate the limit for the following : 5

$$\lim_{x \rightarrow 0} \frac{x^2}{\sec x - 1}$$

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