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BEY–019

BACHELOR OF SCIENCE (APPLIED SCIENCE—ENERGY) (BSCAEY)

Term-End Examination

June, 2025

BEY-019 : REAL ANALYSIS AND DISCRETE MATHEMATICS

Time : 3 Hours *Maximum Marks : 70*

Note : *Question No.* ***1*** *is compulsory. Answer any* ***six*** *questions from the remaining question nos.* ***2*** *to* ***9****. Use of scientific calculator (non-programmable) is allowed in the exam. Symbols have their usual meanings.*

1. State whether the following statements are True *or* False and also give the reasons in support of your answer : 5×2=10

   (a) Two numbers are reciprocal of each other. If the arithmetic mean of the two

numbers be $\frac{13}{12}$, then the numbers are $\frac{2}{5}$ and $\frac{5}{2}$.

(b) $\lim_{x \to z} (x + z) = 2$

(c) The logical equivalent proposition of $p \Leftrightarrow q$ is :

$$(p \to q) \wedge (q \to p).$$

(d) $\int_3^5 6\,dx = 12$

(e) If $y = \frac{1}{x}$, then $\frac{d^2y}{dx^2} = \frac{2}{x^3}$.

2. (a) In a certain town 25% families own a mobile phone, 15% families own a scooter and 65% families own neither a mobile nor a scooter. If 1500 families own both a mobile phone and a scooter, then find the total number of families in the town. 6

(b) (i) Is the function $2x + 7$, one-one function, where x is a real number ? 2

(ii) Is the function $f : \mathbf{R} \to \mathbf{R}$ defined by : 2

$$f(x) = e^{2x+3}, \quad x \in \mathrm{R}$$

an onto function ?

3. (a) Find the domain of the function : 5

$$f(x) = \frac{x^2 + 2x + 1}{x^2 - 8x + 12}$$

(b) Find the range of the function : 5

$$f(x) = \frac{x^2}{1 + x^2}$$

4. (a) What is the equation of a line whose slope is 2 and where y intercept is $\frac{3}{4}$? 5

(b) Find the three numbers in G. P. having sum 19 and product 216. 5

5. Construct truth tables for the following statements : 5+5=10

(a) $(p \to \neg q) \wedge (\neg p \vee q)$

(b) $(\neg q \to \neg p) \vee (p \wedge \neg q)$

6. Solve the following discrete difference equations : 3+7=10

(a) $y_{t+1} = 2y_t + 33$

(b) $y_{t+2} + 15y_{t+1} + 25y_t = 1 + t^2$

7. Evaluate : 3+7=10

(a) $\lim_{x \to 0} \frac{(1 - \cos 2x)\sin 5x}{x^2 \sin 3x}$

(b) $\lim_{x \to 3} \frac{x^3 - x^2 - 18}{x - 3}$

8. (a) If $y = \cos x + \sin x$, find $\frac{dy}{dx}$ at $x = \frac{2\pi}{3}$. 5

(b) If $y = \frac{x - 4}{2\sqrt{\pi}}$, find $\frac{dy}{dx}$ at $x = 1$. 5

9. (a) Evaluate the following integrals : 4

$$I = \int x^3 e^{x^2} dx .$$

(b) $I = \int_0^5 |x^2 - 3x + 2| \, dx$ 6

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