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BEY–019

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

Term-End Examination

December, 2024

BEY-019 : REAL ANALYSIS AND DISCRETE MATHEMATICS

Time : 3 Hours *Maximum Marks : 70*

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

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

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

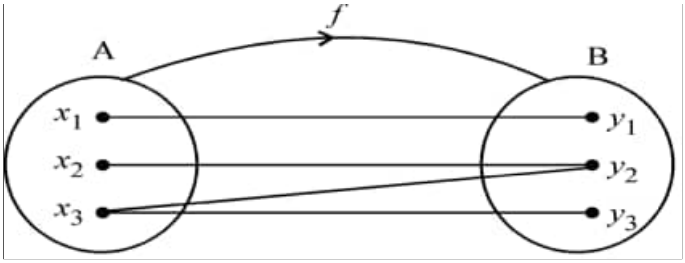
(iv) Symbols have their usual meanings.

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

(a) $n(A' \cap B') = n(\cup) - n(A \cap B)$

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(b) Following rule is a function from A to B :



(c) Contrapositive of $p \to q$ is $\neg p \to \neg q$.

(d) $\lim\limits_{x \to 0} \dfrac{\sin 2x}{\sin 3x} = \dfrac{1}{2}$

(e) $\dfrac{d}{dx}\left(\dfrac{-\pi}{\sqrt{13}}\right) = \dfrac{-\pi}{\sqrt{13}}$

2. If in a class there are 200 students in which 120 take Mathematics, 90 take Physics, 60 take Chemistry, 50 take Mathematics and Physics both, 50 take Mathematics and Chemistry both, 43 take Physics and Chemistry both and 38 take Physics, Chemistry and Mathematics, then find the number of students who have taken exactly one subject. 10

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

$$f(x) = \frac{x^2 + 2x + 1}{x^2 - x - 6}$$

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(b) If :

$$f(x+3) = x^2 + 1,$$

then find $f(x)$. 5

4. (a) Find the centre and radius of the circle given by : 5

$$x^2 + y^2 + 8x + 18y - 30 = 0$$

(b) Find the number of terms in the sequence 4, 12, 20, ..., 108. 5

5. (a) Write the contrapositive of the statement,

"It two triangles are identical, then are similar." Generate its truth table. 5

(b) Construct truth table for : 5

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

6. Solve the following discrete difference equations :

(a) $\Delta\, y_t = 15$ 2.5

(b) $\Delta y_t = -0.4 y_t$ 2.5

(c) $y_{t+2} - 6y_{t+1} + 12y_t = 0$ 5

7. Evaluate :

(a) $\lim\limits_{x \to 0} \dfrac{\sqrt{1+x} - \sqrt{1-x}}{x}$ 5

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

8. (a) If :

$$y = \sqrt{1 + \cos^2 (x^2)},$$

then find $\frac{dy}{dx}$ at $\frac{\sqrt{\pi}}{2}$. 6

(b) If :

$$y = \frac{\sin x + \cos x}{\sin x - \cos x},$$

find $\frac{dy}{dx}$ at $x = 0$. 4

9. Evaluate the following integrals :

(a) $I = \int 5x^2 e^{-3x} dx$ 5

(b) $I = \int_0^3 \frac{x - 5}{(x+1)(x+2)^2} dx$ 5

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