Total No. of Questions: 9]

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(1108)

B.C.A. UG (CBCS) RUSA IIIrd Semester **Examination**

4210

MATHEMATICS-III BCA-0301

Time: 3 Hours]

[Maximum Marks: 70

Note: - Attempt one question from each Part of B, C, D and E. Part-A is compulsory. Marks for Part-B, C, D and E are 10 each and Part-A is of 30 marks.

Part-A

1. (i) Write order and degree of differential equation

$$\left(\frac{d^2y}{dx^2}\right)^2 + \left(\frac{dy}{dx}\right)^3 + 2y = 0$$



- What is particular solution of differential equation?
- Find differential equation that will represent family of straight line y = mx + c.
- (iv) Find modulus and argument of complex number $1+\sqrt{3}i$.

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(ii)

Turn Over

- Find x and y if 2x + (3x + y)i = 4 + 10i. (v)
- (vi) Show that:

$$1 + i^{10} + i^{100} + i^{1000} = 2$$

- (vii) The finite field of order p^n is usually denoted by $GF(p^n)$. In this case p is prime number and n is real number. (True/False)
- (viii) Only even prime number is 2. (True/False)
- (ix) If $a, b, c, d \in I$ and a/b, c/d then ac/bd.

(True/False)

If a and b are relatively prime then any common divisor of ac and b is a divisor of c.

(True/False)

 $1 \times 10 = 10$

(xi) Verify that $y = e^{-3x}$ is a solution of

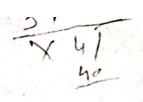
$$\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0. \qquad \begin{cases} -10 \end{cases}$$

(xii) Solve:

$$\frac{dy}{dx} = \frac{-x}{y}$$

(xiii) Find square root of -15 - 8i. $2^2 = (...)$

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(xiv) Find g.c.d. of 35 and 56 and express it as linear combination of these numbers.

(xv) Show that $5^{48} - 1$ is divisible by 24. $\frac{1}{4} \times 5 = 20$ Part-B

- Form the differential equation representing the family of curves $y = A \cos 2t + B \sin 2t$ where A and B are arbitary constant.
 - Solve:

Solve: (a) 3.

$$x^{3} \frac{d^{3}y}{dx^{3}} + 6x^{2} \frac{d^{2}y}{dx^{2}} + 4x \frac{dy}{dx} - 4y = 0$$

Show that $y = (a + bx)e^{2x}$ is a solution of differential equation $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = 0$. 10

Part-C

4. (a) If $(x + iy)^3 = u + iv$ then show that $\frac{u}{x} + \frac{v}{v} = 4\left(x^2 - y^2\right).$

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. (3)

Turn Over

124	2 & -(b)	If 1, w , w^2 are cube roots of unity, then show	
	WU	If 1, w, w^2 are cube roots of unity, then show that $(1 + w - w^2)^6 = 64$.	10

- 5. (a) If α , β are roots of $x^2 2x + 4 = 0$, then prove that $\alpha^6 + \beta^6 = 128$.
- (b) Find the five fifth roots of unity and show that their sum vanishes.

Part-D

- 6. (a) Solve $3x^2 + 9x + 7 \equiv 0 \pmod{13}$
 - (b) Use Chinese Remainder Theorem solve $17x \equiv 9 \pmod{276} \quad 464$
- 7. Prove that the congruence $x^2 \equiv a \pmod{p}$ where p is an odd prime and g.c.d. (a, p) = 1 has exactly two solutions or no solutions.

Part-E

- 8. (a) Prove that $(Q, +, \cdot)$ is a field.
 - (b) Show that $x^4 + 8 \in Q[x]$ is irreducible over Q. 10
- 9. (a) Let F be the field of rational numbers. Determine the degree of splitting field of the Polynomial $x^3 2$ over F.
 - (b) Show that any two finite fields having the same number of elements are isomorphic.

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