Roll No.

Total No. of Questions: 9 [Total No. of Printed Pages: 4

(2102)

BCA (CBCS) RUSA IIIrd Semester Examination

3991

MATHEMATICS-III BCA-301

Time: 3 Hours]

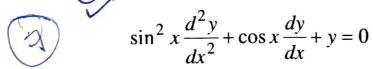
[Maximum Marks: 70

Note: Part-A is compulsory. Attempt *one* question each from Parts-B, C, D and E.

Part-A

(Compulsory Questions)

- 1. (A) Attempt all questions:
 - Write order and degree of the differential equation:

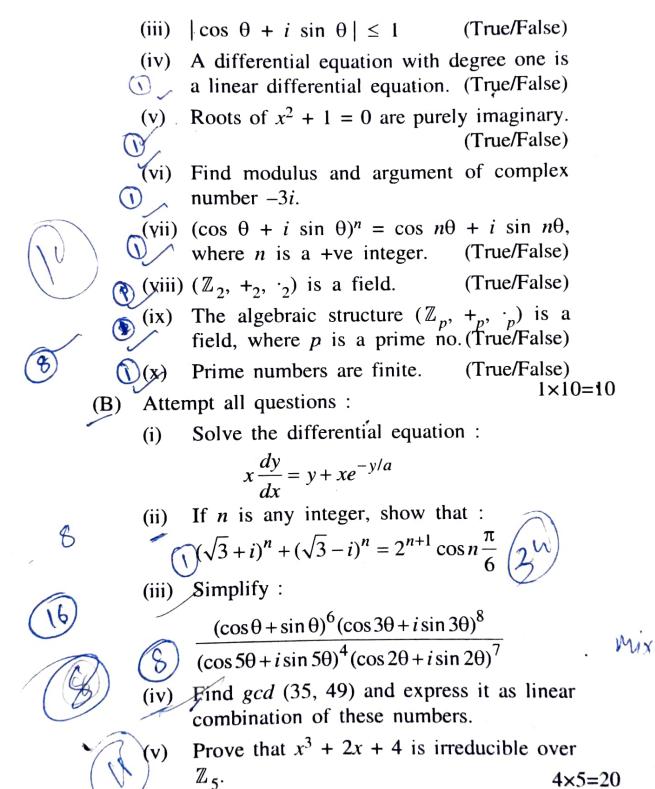


(ii) The intersection of two fields is not a (True/False)

C - 763

(1)

Turn Over



(2)

2. (a) Solve:

$$\int x^3 \frac{d^3 y}{dx^3} + 6x^2 \frac{d^2 y}{dx^2} + 4x \frac{dy}{dx} - 4y = (\log x)^2$$

(b) Solve:

(a) Solve:
$$(D^4 - 1)y = e^x \cos x$$

$$(x^2 + y^2 + 2x)dx + 2ydy = 0$$

(b) Solve:

lve:

$$(D^3 - 3D^2 + 3D - 1)y = (x + 1)e^x$$

Part-C

10 each

4. (a) Prove that:

$$\left(\frac{1+\sin\theta+i\cos\theta}{1+\sin\theta-i\cos\theta}\right)^n = \cos\left(\frac{n\pi}{2}-n\theta\right)+i\sin\left(\frac{n\pi}{2}-n\theta\right)$$

where n is any integer.

If z_1 , z_2 are two non-zero complex numbers, prove that:

$$|z_1 + z_2|^2 + |z_1 - z_2|^2 = 2[|z_1|^2 + |z_2|^2]$$

- 5. A triangle is formed by the points z_1 , z_2 , z_3 in the Argand's diagram. Prove that its:
 - Centroid is given by:

$$\frac{z_1 + z_2 + z_3}{3}$$

(b) Circum-centre is given by :

$$|z - z_1| = |z - z_2| = |z - z_3|$$

Part-D

10 each

- 6. Find the set of integers solutions for each of the following:
 - $(a) \quad 15x \equiv 25 \pmod{25}$
 - (b) $9x \equiv 14 \pmod{15}$
- 7. Find the smallest positive integer that when divided by 3, 5, 7 we get remainder 1, 4, 6 respectively.

Part-E.

10 each

No. (a) Let a and b be two elements of a finite field F. Then prove that there exist elements α and β in F such that :

$$\alpha + a\alpha^2 + b\beta^2 = 0$$

- (b) Prove that $(\mathbb{Z}_5, +_5, \cdot_5)$ is a field.
- (a) Find all nilpotent and idempotent elements of (Z₁₀, +₁₀, ·₁₀).
 - (b) Construct a field extension of Z₃ with exactly 9 elements.