

Seat Number

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Nov-2019



नवमी - 031

MATHEMATICS PAPER-II : MTH-202
Theory of Equations
(821102)

P. Pages : 4

Time : Two Hours

Max. Marks : 60

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory.
5. Figures to the right indicates full marks.

1. a) Attempt **any six** of the following (choose the correct option).

6

- i) If a & b are relatively prime then g.c.d. of a & b is ----
a) 0
b) 1
c) -1
d) None of these
- ii) A polynomial equation $f(x) = 0$ of n^{th} degree $n \geq 1$ has at least ----
a) no root
b) one root
c) two roots
d) none of these
- iii) If α, β, γ be roots of equation $ax^3 + bx^2 + cx + d = 0$ then $\Sigma\alpha\beta = \dots$
a) $\frac{c}{a}$
b) $\frac{a}{c}$
c) $\frac{-b}{a}$
d) None of these
- iv) Remove the second term from the equation $x^4 - 8x^3 + x^2 - x + 3 = 0$ the roots are diminished by ----
a) -2
b) 2
c) -1
d) None of these
- v) Least common multiple of 6 & 10 is
a) 6
b) 10
c) 30
d) None of these

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- vi) Let $f(x) = a_0 + a_1x + a_2x^2 + \dots + a_nx^n$
 $g(x) = b_0 + b_1x + b_2x^2 + \dots + b_mx^m$
then $\deg[f(x) + g(x)] = \dots$
a) $\min(m,n)$ b) $\max(m,n)$
c) m,n d) None of these
- vii) The equation $x^4 + 4x^3 - 2x^2 - 12x + 19 = 0$ has pair of equal roots
then $\alpha + \alpha + \beta + \beta = \dots$
a) 4 b) -4
c) -12 d) None of these
- viii) Change the signs of the roots of equation $3x^8 + 5x^5 - 2x^2 + 4 = 0$ is
a) $3x^8 - 5x^5 - 2x^2 - 4 = 0$ b) $3x^8 + 5x^5 + 2x^2 + 4 = 0$
c) $3x^8 - 5x^5 + 2x^2 + 4 = 0$ d) None of these
- ix) If $(a,b) = 1$ then $(a^2, b^2) = \dots$
a) 1 b) a^2
c) b^2 d) None of these

b) Attempt any six of the following.

6

- i) State the well ordering principle.
- ii) Write the monic polynomial of degree 6.
- iii) Define solution of an equation.
- iv) Let $f(x) = a_0x^n + a_1x^{n-1} + \dots + a_{n-1}x + a_n = 0$ whose roots are diminished by h , then find h to remove third term.
- v) Define composite number.
- vi) Let the equation $x^3 - 3x^2 + 4 = 0$, if two roots are equal then find $\sum \alpha$.
- vii) Find the equation whose roots are reciprocal of the roots of $x^4 - 3x^3 + 7x^2 + 5x - 2 = 0$.
- viii) State the Descartes rule of signs for positive roots.
- ix) State whether the following statement is true or false if $(a,b) = (a,c)$ then $(a^2, b^2) = (a^2, c^2)$.

2. Attempt **any six** of the following.

12

- i) Find g.c.d. of 117 and 45.
- ii) State remainder theorem for polynomials.
- iii) Find the condition that the roots of equation $x^3 - 6x^2 + 3x + 10 = 0$ are in A.P.
- iv) Remove the fractional coefficients from the equation $x^3 + \frac{1}{2}x^2 + \frac{2}{3}x + 1 = 0$
- v) State Peano's Axioms.
- vi) Define divisibility of polynomials.
- vii) If α, β are roots of equation $x^2 + 5x + 1 = 0$ then find $\frac{1}{\alpha} + \frac{1}{\beta}$.
- viii) Find the equation whose roots are equal in magnitude but opposite in signs of roots $x^5 + 4x^3 - 6x^2 + 4x - 7 = 0$.
- ix) If a/b and a/c then prove that $a/b + c$.

3. Attempt **any four** of the following.

12

- i) Use principle of finite Induction prove that $x^n - y^n$ is divisible by $x + y$ for all even integers.
- ii) Show that $\sqrt{3}$ is not rational number.
- iii) Use synthetic division to find quotient and remainder when $x^5 + 3x^4 + 5x^2 - 2$ is divided by $x - 3$.
- iv) Find g.c.d. of polynomials $f(x) = x^4 + x^3 + 4x^2 - x - 5$ & $g(x) = x^2 - 1$.
- v) Solve the equation $x^3 - 3x^2 - 16x + 48 = 0$ if sum of two of it's root is zero.
- vi) Find the equation whose roots are those of $3x^3 - 2x^2 + x - 9 = 0$ each diminished by 5.

4. Attempt any three of the following.

12

- i) If p is prime and a, b are integers such that $p|ab$ then prove that $p|a$ or $p|b$.
- ii) Find g.c.d. of 252 and 595 & express it in the form $252m + 595n$.
- iii) State and prove factor theorem for polynomials.
- iv) If α, β, γ are roots of equation $x^3 - px^2 + qx - r = 0$ then find the value of $\frac{1}{\beta^2\gamma^2} + \frac{1}{\gamma^2\alpha^2} + \frac{1}{\alpha^2\beta^2}$.
- v) Remove the second term from the equation $x^4 + 16x^3 + 83x^2 + 152x + 84 = 0$.

5. Attempt any two of the following.

12

- i) Find the product of polynomials where $f(x) = 1 - 3x + 2x^2$ & $g(x) = 3 - x + 4x^2 - x^3$.
- ii) If α, β, γ are roots of cubic equation $x^3 + px^2 + qx + r = 0$ find the value of i) $\Sigma\alpha^2\beta$ ii) $\Sigma\alpha^2$.
- iii) Solve the equation $x^3 + 6x^2 + 9x + 4 = 0$ by Carden's method.
