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UG — Math (D – 603) A
(Equation)

2020

Time : 2 hours

Full Marks : 80

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

*Answer any **three** questions in which Q. No. 1 is compulsory.*

1. Answer **all** questions of the following : 2×10 = 20

(a) Form a cubic equation whose two roots are 3, 2+i.

(b) State discreate rule of sign.

(c) If α, β, γ are the roots of $x^3 - 5x^2 + 7x - 8 = 0$ find $\alpha\beta + \beta\gamma + \gamma\alpha$ and $\alpha.\ \beta.\ \gamma$.

(d) Find the equation whose roots are three times of the roots of the equation $3x^3 + 5x^2 + 2x - 10 = 0$

(e) Write down the nature of the roots $x^3 + 3Hx + G = 0$

(f) Show that the equation $x^5 + x^3 - 8x - 5 = 0$ can not have more than three real roots

(g) Define Sturm's function.

(h) State fundamental theorem of algebra

(i) Using synthetic division, find quotient and remainder when $x^4 - 10x^3 + 8x^2 + 12x + 5$ is divided by $x - 2$.

(j) Transform the equation $x^4 + 8x^3 + x - 5 = 0$ into one in which the 2nd term is missing

2. (a) Every equation of nth degree has n roots and no more 15

(b) Show that the equation

$$\frac{A^2}{x-a} + \frac{B^2}{-b} + \frac{C^2}{x-c} + \cdots + \frac{L^2}{x-\ell} = x - m$$

where a, b, c, — ℓ an numbers different from one another can not have on imaginary roots 15

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3 (a) If $\alpha_1, \alpha_2, \alpha_3, \ldots \alpha_n$ are the roots of $a_0x^n + a_1x^{n-1} + a_2x^{n-2} + \ldots + a_n = 0$ then find the relation between $\alpha_1, \alpha_2, \alpha_3, \ldots \alpha_n$ with $a_0, a_1, a_2 \ldots a_n$ 15

(b) Find the condition that the roots of the equation $x^4 + px^3 + qx^2 + rx + S = 0$ may be in G P 15

4 (a) Calculate the value of the following symmetric functions for the equation $x^3 + px^2 + qx + r = 0$ whose roots are α, β, γ are . 15

(i) $\Sigma\alpha^2$

(ii) $\Sigma\alpha^2\beta$

(iii) $\Sigma\alpha\beta$

(b) If α, β, γ are the roots of $x^3 + 3x + 9 = 0$, find the value of $\alpha^9 + \beta^9 + \gamma^9$. 15

5 (a) Find the equation whose roots on the cubic of the roots of the equation $x^4 - 2x^3 - x^2 + 2x + 1 = 0$ 15

(b) If α, β, γ are the roots of $x^3 + px^2 + qx + y = 0$, find the equation whose roots are $\beta + \gamma, \gamma + \alpha, \alpha + \beta$ 15

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6 (a) Solve the equation $x^3 - 9x + 28 = 0$ by Cardon's Method 15

(b) Solve $x^4 - 3x^2 - 42x - 40 = 0$ by descarate method 15

7 (a) Find the real roots of the equation by Stum's function

$x^3 + 2x^2 - 51x + 110 = 0$ 15

(b) Find the equation whose roots are the roots of $x^4 - 5x^3 + 7x^2 - 17x + 11 = 0$ each diminish by 4. 15

8 State and prove Stum's Theorem. 30

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