

Level: First Year

Program: Mathematics

Algebra

Total: 140



Faculty of Science

Mathematics Department

1st Semester

Time: 3 hour

Date: 18/1/2015

Answer the following Questions:

Question (1)

- (1) Decompose the following fraction into partial fractions (21 Marks)

$$\frac{3x^2 - 7x + 6}{(x^2 - 4x + 4)(x + 2)}$$

- (2) Show, by mathematical induction, that (21 Marks)

$$\sum_{r=1}^n (3r - 1) = \frac{1}{2} n(3n + 1)$$

- (3) Find the remaining roots of the function (21 Marks)

$$f(x) = x^4 - 3x^3 - 5x^2 + 13x + 6,$$

where $1 + \sqrt{2}$ is one of its zeros.

Question (2)

- (1) If the remainder for division $f(x)$ over x is 1, over $(x + 1)$ is 2 and over $(x + 2)$ is 5. Find the remainder of division of $f(x)$ over $x(x + 1)(x + 2)$. (14 Marks)

- (2) Solve the equation $x^3 - 3x^2 - 13x + 15 = 0$, whose roots are in arithmetical progression. (14 Marks)

- (3) Find the equation whose roots exceed by 2 the roots of the equation $4x^4 + 32x^3 + 83x^2 + 76x + 21 = 0$. Hence solve the equation. (14 Marks)

Question (3)

- (1) Solve, by Cardan's Method, the equation $x^3 - 6x^2 - 15x + 100 = 0$. (14 Marks)

- (2) If $z = 1 + i\sqrt{3}$ find $\sqrt[3]{z}$, and z^6 . (14 Marks)

- (3) Expand $\cos 4\theta$, $\sin 4\theta$ in power of $\cos \theta$, $\sin \theta$ and show that $\operatorname{cosec} \theta \sin 4\theta = 8\cos^3 \theta - 4\cos \theta$. (14 Marks)

Best Wishes;

Dr. Tamer Mohamed El-Azab