

B.A. (Honours) Examination, 2018
Semester-II
Integrated Mathematics and Statistics
Paper: S-1.2.5.P.3 (Subsidiary) (Old Syllabus)
Mathematics (Algebra-I)

Time: Three Hours

Full Marks: 40

Questions are of value as indicated in the margin

1. Answer **any four** questions

$4 \times 3 = 12$

(a) Find the modulus and amplitude of the complex number $z = \cos \beta + i \sin \beta$

(b) Express $(1 + i\sqrt{3})$ in the form of $r(\cos\theta + i \sin\theta)$

(c) Write down the statement of De Moivre's Theorem

(d) Find the remainder when $(x^5 - 4x^4 + 7x^3 - 11x - 13)$ is divided by $(x - 2)$.

(e) What is Descartes' rule of signs? Apply it to find the nature of roots of the equation

$$3x^4 + 12x^2 + 5x - 4 = 0$$

(f) Diminish the roots of the equation $x^3 + x - 2 = 0$ by 2.

(g) if $A = \{1,2,3\}$ and $B = \{4,5\}$ find $A \times B$

(h) If '*' denotes permutation multiplication, then show that

$$(1\ 3)(2\ 4\ 5) * (2\ 3) = (1\ 3\ 4\ 5\ 2)$$

2. Answer **any four** questions

$4 \times 4 = 16$

(a) if $\sqrt[3]{x + iy} = a + ib$ then show that $\frac{x}{a} + \frac{y}{b} = 4(a^2 - b^2)$

(b) Expand $\cos 5\theta$ in terms of $\cos \theta$

(c) Find the value of $(x^3 - 7x^2 - 2x + 88)$ when $x = 5 + i\sqrt{3}$.

(d) Show that $(x^4 + 2x^3 - 13x^2 - 14x + 24)$ is exactly divisible by $(x+4)$

(e) Express $(3x^4 + 5x^3 - 2x^2 + 4x + 6)$ as a polynomial of $(x-1)$

(f) Find the roots of the equation $x^3 - 7x^2 + 36 = 0$, given that one of the roots of the equation is double of the other.

(g) If f and g represents two mapping from \mathbb{R} to \mathbb{R} (set of real numbers) such that

$$f(x) = 4x - 1 \quad \text{and} \quad g(x) = x^3 + 2,$$

then find the products of the two mappings $(f \circ g)$ and $(g \circ f)$

(h) Show that 0 is the identity element in the set $\{0,1,2\}$, for the operation ' $*$ ', which is defined as: $a * b = \text{remainder of } (a + b)/3$

P.T.O.

(2)

3. Answer *any two* questions:

$2 \times 6 = 12$

(a) Find the Euler's exponential values of $\cos x$ and $\sin x$

(b) Solve $x^3 - 24x + 72 = 0$ by Cardan's method

(c) What do you mean by onto and one-one mapping? If the function $f: \mathbb{R} \rightarrow \mathbb{R}$ is defined by

$$f(x) = x^2 + 1,$$

then find $f^{-1}(-5)$ and $f^{-1}(17)$

(d) What is an *abelian group*? Give an example of an *abelian group*.