

B.A. (Honours) Examination, 2019
Semester-II
Integrated Mathematics & Statistics
Course- S-1.2.5.P.3 (Subsidiary)

(For Back Candidates)

Time: Three Hours

Full Marks: 40

Questions are of value as indicated in the margin.

1. Answer **any four** questions 4×3=12
- (i) Find the modulus and amplitude of $(\cos\beta - i \sin\beta)$
 - (ii) Express $(1 + i\sqrt{3})$ in the form of $r(\cos\theta + i \sin\theta)$
 - (iii) Show that $\frac{a+ib}{c+id}$ may be real, if $ad=bc$.
 - (iv) Find the relation between 'a' and 'b' such that $(4x^3 - 3x^2 + 2ax + b)$ is exactly divisible by $(x + 2)$
 - (v) Find a cubic equation with rational coefficients which has its two roots as '1' and $(2 + 3i)$
 - (vi) Diminish the roots of the equation $x^3 + x - 2 = 0$ by 2.
 - (vii) If $A=\{a,b,c\}$ and $B=\{x,y,z\}$, then give an example each for *onto* and *into* mapping considering A as domain and B as co-domain.
 - (viii) Define permutation as a mapping. Find the set of all possible permutations with the elements of a set $S = \{1,2,3\}$. Which one of them is 'identity permutation'?
2. Answer **any four** questions 4×4=16
- (i) if $\sqrt[3]{x + iy} = a + ib$ then show that $\frac{x}{a} + \frac{y}{b} = 4(a^2 - b^2)$
 - (ii) Express $\left(\frac{\cos\theta - i \sin\theta}{\sin\theta - i \cos\theta}\right)^3$ in the form $(a + ib)$
 - (iii) Expand $\cos 7\theta$ in terms of $\cos\theta$
 - (iv) Express $(3x^4 + 5x^3 - 2x^2 + 4x + 6)$ as a polynomial of $(x-1)$
 - (v) Prove that the equation $x^3 + x^2 - 5x - 1 = 0$ has one positive root between (1,2) and two negative roots between $(-1,0)$ and $(-3,-2)$.
 - (vi) Remove the second term of the equation $x^3 + 6x^2 + 12x - 9 = 0$

P.T.O.

(2)

(vii) If f and g represents two mapping from \mathbb{R} to \mathbb{R} (set or real numbers) such that $f(x) = 4x - 1$ and $g(x) = x^3 + 2$,

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

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

3. Answer **any two** questions

2×6=12

(i) State De Moivre’s Theorem. Prove the Theorem for ‘n’ being a negative integer.

(ii) What is Descartes’ rule of sings? Show that the equation $x^3 - 16x^2 - x - 1 = 0$ has one and only one positive root. Show that this root is greater than 8.

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

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