EXAM PATTERN QUESTIONS

JEE ADVANCED 2020

MATHEMATICS

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1. If z, z_2 are non-zero complex numbers such that $|z_1| = |z_2| = |z_1 + z_2|$ then z_1/z_2 can be
   (a) 1
   (b) ω
   (c) ω^2
   (d) -1

2. Modulus of complex number whose reciprocal is
   Match the entries in Column I with entries in Column II

Column-I		Column-II	
(a)	$\frac{1}{a}+\frac{1}{b+ic}$	(p)	$\frac{\sqrt{a^2+b^2}\,\sqrt{a^2+c^2}}{\lvert b-c\rvert}$
(b)	$\frac{1}{a-ib}-\frac{1}{a-ic}$	(q)	$\sqrt{a^2+(b+c)^2}$
(c)	$\frac{b}{a+ib}+\frac{c}{a-ic}$	(r)	$\frac{\lvert a\rvert\,\sqrt{b^2+c^2}}{\sqrt{(a+b)^2+c^2}}$
(d)	$\frac{1}{a+ib+ic}$	(s)	$\frac{\sqrt{a^2+b^2}\,\sqrt{a^2+c^2}}{\lvert a\rvert\,\lvert b+c\rvert}$

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www.misostudy.com
☎ 8929803804 (MON-SAT:9am-6pm) support@misostudy.com
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2ND FLOOR 65-A, OMPRO TOWER, KALU SARAI, NEW DELHI, DELHI 110016

	p	q	r	s
(a)	ⓟ	ⓠ	ⓡ	ⓢ
(b)	ⓟ	ⓠ	ⓡ	ⓢ
(c)	ⓟ	ⓠ	ⓡ	ⓢ
(d)	ⓟ	ⓠ	ⓡ	ⓢ

3. Let α, β be roots of the equation $ax^2 + bx + c = 0$, then equation whose roots are
Match the entries in Column-I with entries in Column-II

Column-I	Column-II
(a) $-1/\alpha, -1/\beta$	(p) $ax^2 + 2bx + 4c = 0$
(b) $-\alpha, -\beta$	(q) $a^2x^2 + (2ac - b^2) + c^2 = 0$
(c) α^2, β^2	(r) $cx^2 - bx + a = 0$
(d) $2\alpha, 2\beta$	(s) $ax^2 - bx + c = 0$

	p	q	r	s
(a)	ⓟ	ⓠ	ⓡ	ⓢ
(b)	ⓟ	ⓠ	ⓡ	ⓢ
(c)	ⓟ	ⓠ	ⓡ	ⓢ
(d)	ⓟ	ⓠ	ⓡ	ⓢ

4. **Statement-I :** If all the four roots of $x^4 - 4x^3 + ax^2 - bx + 1 = 0$ are positive, than $a = 6$ and $b = 4$.
Statement-II : If polynomial equation $P(x) = 0$ has four positive roots, then the polynomial equation $P'(x) = 0$ has atleast 3 positive roots.
(a) Statement-I is True, Statement-II is True; Statement-II is correct explanation for Statement-I.
(b) Statement-I is True, Statement-II is true; Statement-II is not a correct explanation for Statement-I.
(c) Statement-I is True, Statement-II is False.
(d) Statement-I is False, Statement-II is True.

5. Let $a, b, c \in \mathbf{C}$ such that $a + b + c = 0$.
If $|a| = |b| = |c| = 1$, then $|a - b|^3 + |b - c|^3 + |c - a|^3 - 3|a - b||b - c||c - a|$ is equal to

6. $a, b, c \in \mathbf{R}$ and a, b, c are in A.P. Match the expression in Column-I with the conditions/properties in Column-II.

Column-I	Column-II
(a) a^2, b^2, c^2 are in A.P.	(p) $a = b = c$
(b) a^2, b^2, c^2 are in G.P.	(q) $-\frac{1}{2}a, b, c$ are in G.P.
(c) a^2, b^2, c^2 are in H.P.	(r) $a, b, -\frac{1}{2}c$ are in G.P.
(d) $a + b + c = \frac{3}{2}$	(s) $b = \frac{1}{2}$

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