Dear student following is an Easy level [● ○ ○] test paper. Score of 21 Marks in 15 Minutes would be a satisfactory performance. Questions 1-9 (+3, –1) (Questions may have more than one option correct)

Q.1 If the sum of the coefficients in the expansion of $(\ell^2 x^2 - 2\ell x + 1)^{51}$ vanishes then ℓ is equal to-

(A) 2 (B) –1 (C) 1 (D) –2

Q.2 The number of values of r satisfying the equation ${}^{69}C_{3r-1} - {}^{69}C_{r^2} = {}^{69}C_{r^2-1} - {}^{69}C_{3r}$ is-

(A) 1 (B) 2 (C) 3 (D) 7

Q.3 The interval in which x must lie so that the numerically greatest term in the expansion of $(1 - x)^{21}$ has the greatest coefficient is, $(x > 0)$

(A) $\left[\frac{5}{6}, \frac{6}{5}\right]$ (B) $\left(\frac{5}{6}, \frac{6}{5}\right)$

(C) $\left(\frac{6}{7}, \frac{7}{6}\right)$ (D) $\left[\frac{6}{7}, \frac{7}{6}\right]$

Q.4 The coeficient of x^5 in the expansion of $(x^2 - x - 2)^5$ is-

(A) – 83 (B) – 82

(C) – 86 (D) – 81

Q.5 If in the expansion of $(2x + 5)^{10}$, the greatest term is equal to the middle term, then the value of x belongs to-

(A) (–3, 3) (B) [–3, 3]

(C) $(-\infty, 3)$ (D) $(3, \infty)$

Q.6 If $z = \left(\frac{\sqrt{3}}{2} + \frac{i}{2}\right)^5 + \left(\frac{\sqrt{3}}{2} - \frac{i}{2}\right)^5$, then-

(A) Re(z) = 0

(B) Im(Z) = 0

(C) Re(z) > 0, $I_m(z) > 0$

(D) Re(z) > 0, $I_m(z) < 0$

Q.7 In the usual notations $C_1 + 2C_2x + 3C_3x^2 + \dots\dots\dots + nC_nx^{n-1}$ is equal to-

(A) $n(1 + x)^{n-1}$

(B) $n(1 + x)^n$

(C) $(n - 1)(1 + x)^{n-1}$

(D) $(n - 1)(1 + x)^n$

Q.8 The number of terms in the expansion of $(a + b + c)^n$, where $n \in N$, is-

(A) $\frac{(n+1)(n+2)}{2}$ (B) n + 1

(C) n +2 (D) (n + 1)n

Q.9 If n is an even natural number and coefficient of x^r in the expansion of $\frac{(1+x)^n}{1-x}$ is 2^n, $(|x| < 1)$, then-

(A) $r \le n/2$ (B) $r \ge \frac{n-2}{2}$

(C) $r \le \frac{n+2}{2}$ (D) $r \ge n$

MATHEMATICS IIT JEE (SEPT. 5th WEEK CLASS TEST 1) (BINOMIAL THEOREM) ANSWER KEY

Name : .... **Roll No. :** ....

	A	B	C	D		A	B	C	D		A	B	C	D
1	○	○	○	○	4	○	○	○	○	7	○	○	○	○
2	○	○	○	○	5	○	○	○	○	8	○	○	○	○
3	○	○	○	○	6	○	○	○	○	9	○	○	○	○

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9
Ans.	C	C,D	B	D	A	B	A	A	D

SOLUTIONS

Sol.1 (C)

$[(1 - \ell x)^2]^{51}$

$\Rightarrow (1 - \ell x)^{102} = A_0 + A_1x + A_2x^2 + ...$

Put $x = 1$

$(1 - \ell)^{102} = A_0 + A_1 + A_2 + ...$

Therefore $\ell = 1$.

Sol.2 (C, D)

$^{69}C_{3r-1} + {}^{69}C_{3r} = {}^{69}C_{r^2-1} + {}^{69}C_{r^2}$

$\Rightarrow \quad {}^{70}C_{3r} = {}^{70}C_{r^2}$

Thus $r^2 = 3r$ or $70 - 3r = r^2$

so that $r = 0, 3$ or $7, -10$.

Hence $r = 3$ and 7 (as the given is not defined for $r = 0$ and -10).

Sol.3 (B)

Numerically greatest coefficient in the expansion of $(1 - x)^n$ is $^nC_{(n-1)/2}$ or $^nC_{(n+1)/2}$

Numerically greatest coefficient is

$^{21}C_{10}$ or $^{21}C_{11}$

$|{}^{21}C_{10}\, x^{10}| > |{}^{21}C_9\, x^9| \Rightarrow x > 5/6$

Similarly, $x < \frac{6}{5}$

$\Rightarrow x \in \left(\frac{5}{6}, \frac{6}{5}\right)$.

Sol.4 (D)

$(x - 2)^5 (x + 1)^5$

$\Rightarrow [{}^5C_0\, x^5 - {}^5C_1\, x^4 \times 2 + ...]$
$[{}^5C_0 + {}^5C_1\, x + ...]$

Coefficient of x^5

$= 1 - 5.5.2 + 10.10.4 - 10.10.8 + 5.5.16 - 32$

$= -81$.

Sol.5 (A)

In the expansion of $(2x + 5)^{10}$, the middle term $= T_6$

$\Rightarrow \dfrac{n+1}{1+\left|\frac{2x}{5}\right|} > 5$

$\Rightarrow \dfrac{11}{5} - 1 > \left|\dfrac{2x}{5}\right|$

$\Rightarrow |x| < 3 \Rightarrow x \in (-3, 3)$

Sol.6 (B)

$$z = 2\left[\left(\frac{\sqrt{3}}{2}\right)^5 + {}^5C_2\left(\frac{\sqrt{3}}{2}\right)^3\frac{i^2}{4} + {}^5C_4\left(\frac{\sqrt{3}}{2}\right)\frac{i^4}{16}\right]$$

= Pure real number.

Hence $\text{Im}(z) = 0$.

Sol.7 (A)

$(1 + x)^n = C_0 + C_1x + C_2x^2 + C_3x^3 + ... + C_n x^n$

Differentiating

$n(1 + x)^{n-1} = C_1 + 2C_2x + 3C_3x^2 + ... + nC_n x^{n-1}$

Sol.8 (A)

$(a + (b + c))^n = a^n + {}^nC_1\, a^{n-1} (b + c)^1 + {}^nC_2\, a^{n-2} (b + c)^2 + ... + {}^nC_n (b + c)^n$

Further expanding each term of R.H.S.,

First term on expansion gives one term.

Second term on expansion gives two terms

Third term on expansion gives three terms and so on.

$\therefore$ Total no. of terms $= 1 + 2 + 3 + ...$

$(n + 1) = \dfrac{(n+1)(n+2)}{2}$.

Sol.9 (D)

$\dfrac{(1+x)^n}{1-x} = (C_0 + C_1x + C_2x^2 + ... + C_nx^n)$
$(1 + x + x^2 + ...)$

The coefficient of $x^r = C_0 + C_1 + C_2 + C_3 + ... + C_r = 2^n$ for $r = n$.

Moreover coefficient of x^r is $C_0 + C_1 + C_2 + C_3 + ... + C_r$ if $r > n$. So $r \geq n$.