Dear student following is an easy level [● ○ ○] test paper. Score of 24 Marks in 15 Minutes would be a satisfactory performance. Questions 1-10(+3, –1) (All questions have only one option correct)

Q.1 If the coefficients of 2nd, 3rd and 4th terms in the expansion of $(1 + x)^n$ are in A.P. then n equals

(A) 2 (B) 7
(C) 9 (D) None of these

Q.2 The coefficient of x^{10} in the expansion $(1 + x^2 - x^3)^8$ is

(A) 476 (B) 496
(C) 506 (D) 528

Q.3 The value of expression $\frac{^{10}C_r}{^{11}C_r}$ when both numerator and denomenator have their greatest value is

(A) $\frac{10}{11}$ (B) $\frac{6}{5}$
(C) $\frac{6}{11}$ (D) None of these

Q.4 The coefficient of x^4 in the expansion of $(1 + x + x^2 + x^3)^n$ is

(A) $^nC_1 \times {^nC_2} + {^nC_2} + {^nC_4}$
(B) $^nC_1 \times {^nC_3} + {^nC_2} + {^nC_4}$
(C) $^nC_2 \times {^nC_2} + {^nC_4}$ (D) None of these

Q.5 If the coefficeint of x^7 and x^8 in $\left(2+\frac{x}{3}\right)^n$ are equal, then value of n is

(A) 56 (B) 55
(C) 47 (D) 19

Q.6 If A and B are coefficients of x^n in the expansions of $(1 + x)^{2n}$ and $(1 + x)^{2n-1}$ respectively, then

(A) A = B (B) A = 2B
(C) 2A = B (D) None of these

Q.7 In the expansion of $(1 + px)^n$, $n \in N$, the coefficient of x and x^2 are 8 and 24 respectively, then

(A) n = 3, p = 2 (B) n = 4, p = 2
(C) n = 4, p = 3 (D) n = 5, p = 3

Q.8 The term independent of x in the expansion of $\left(2x + \frac{1}{3x^2}\right)^9$ is

(A) 2^{nd} (B) 3^{rd} (C) 4^{th} (D) 5^{th}

Q.9 The middle term in the expansion of $\left(\frac{2}{3}x - \frac{3}{2}y\right)^{20}$ is

(A) $^{20}C_{10}\ x^{10}\ y^{10}$ (B) $x^{10}\ y^{10}$
(C) $^{20}C_{10}\ (2/3)^{10}(xy)^{10}$ (D) $-x^{10}\ y^{10}$

Q.10 Coefficient of x^4 in the expansion of $\frac{1 - 3x + x^2}{e^x}$ is

(A) $\frac{25}{24}$ (B)n $\frac{24}{25}$
(C) $\frac{4}{25}$ (D) $\frac{25}{4}$

MATHEMATICS IIT JEE (SEPT.4th 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	○	○	○	○
										10	○	○	○	○

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	B	A	C	A	B	B	B	C	A	A

SOLUTIONS

Sol.1 (B)

The coefficients of 2nd term is ${}^nC_1$

The coefficients of 3rd term in = ${}^nC_2$

The coefficients of 4th term is = ${}^nC_3$

$\because$ These coefficients are in A.P

$\therefore$ $2.{}^nC_2 = {}^nC_1 + {}^nC_3$

$2.\frac{n(n-1)}{2!} = n + \frac{n(n-1)(n-2)}{3!}$

$\Rightarrow 6(n - 1) = 6 + (n^2 - 3n + 2)$ $[\because n \neq 0]$

$\Rightarrow n^2 - 9n + 14 = 0 \Rightarrow n = 2, 7$

But n = 2 not admissable as expansion contain more than 3 terms.

Thus n = 7

Sol.2 (A)

General term in the expansion of $(1 + x^2 - x^3)^8$ is

$T = \frac{8!}{p!q!r!} 1^p (x^2)^q (-x^3)^r$

where p + q + r = 8

or $T = \frac{8!}{p!q!r!}(-1)^r x^{2q+3r}$

$0 \le p, q, r \le 8, p + q + r = 8$

This will contain x^{10} if 2q + 3r = 10

We can choose, p, q, r to satisfy all these conditions as follows

q = 2, r = 2 p = 4 and q = 5, r = 0 p = 3

Then coeff. of x^{10} will be $\frac{8!}{4!2!2!}(-1)^2$

and $\frac{8!}{3!5!0!}(-1)^0$

Sum of the coeff. of x^{10} is

$S = \frac{8!}{4!2!2!} + \frac{8!}{3!5!} = 420 + 56 = 476$

Sol.3 (C)

The greatest value of ${}^mC_r$ occurs for r = m/2

If m is even and for $r = \frac{m-1}{2}$ and $\frac{m+1}{2}$ when m is odd.

Thus greatest value of ${}^{10}C_r = {}^{10}C_5$

and greatest value of ${}^{11}C_r = {}^{11}C_5, \left[r = \frac{11-1}{2}\right]$

Required value is $\frac{{}^{10}C_5}{{}^{11}C_5} = \frac{10!/5!5!}{11!/5!6!} = \frac{6}{11}$

Sol.4 (A)

We have $(1 + x + x^2 + x^3)^n$

$= [(1 + x)(1 + x^2)]^n$

$= [1 + {}^nC_1x + {}^nC_2x^2 + {}^nC_3x^3 + {}^nC_4x^4 ...]$

$[1 + {}^nC_1x^2 + {}^nC_2x^4 +....]$

Coeff. of x^4 is $1.\ {}^nC_2 + {}^nC_2.{}^nC_1 + {}^nC_4$

Sol.5 (B)

(r + 1)th term in the expansion of $\left(2 + \frac{x}{3}\right)^n$

is given by

$T_{r+1} = {}^nC_r\, 2^{n-r}\left(\frac{x}{3}\right)^r = {}^nC_r\left(\frac{2^{n-r}}{3^r}\right)x^r$

According to the given codition

${}^nC_7\left(\frac{2^{n-7}}{3^7}\right) = {}^nC_8\left(\frac{2^{n-8}}{3^8}\right)$

$$\Rightarrow \frac{{}^nC_7}{{}^nC_8} = \frac{2^{n-8}}{3^8} \cdot \frac{3^7}{2^{n-7}}$$

$$\Rightarrow \frac{n!}{7!(n-7)!} \frac{8!(n-8)!}{n!} = \frac{1}{6}$$

$$\Rightarrow \frac{8}{n-7} = \frac{1}{6}$$

$\Rightarrow$ 48 = n −7 $\Rightarrow$ n = 55

Sol.6 (B)

We know that coefficient of x^r in the expansion of $(1 + x)^m$ is ${}^mC_r$.

Thus, A = ${}^{2n}C_n$ and B = ${}^{2n-1}C_n$

We have $\frac{A}{B} = \frac{{}^{2n}C_n}{{}^{2n-1}C_n} = \frac{(2n)!}{n!n!} \frac{(n!)(n-1)!}{(2n-1)!}$

$$= \frac{2n}{n} = 2$$

$\Rightarrow$ A = 2B

Sol.7 (B)

We have

$(1 + px)^n = 1 + {}^nC_1 (px) + {}^nC_2(px)^2 + ...$

$= 1 + npx + \frac{1}{2} n(n - 1) p^2 x^2 + ...$

According to the hypothesis,

np = 8 and $\frac{1}{2} n(n - 1) p^2 = 24$

Putting P = 8/n in the second expression, we get

$$\frac{1}{2} n(n - 1) \left(\frac{8}{n}\right)^2 = 24$$

$$\Rightarrow \frac{n-1}{n} = \frac{24 \times 2}{8 \times 8} = \frac{3}{4}$$

$\Rightarrow$ 4n − 4 = 3n $\Rightarrow$ n = 4

Putting this value in np = 8, we get p = 2.

Sol.8 (C)

Suppose (r + 1)th term is independent of x. We have

$$T_{r+1} = {}^9C_r (2x)^{9-r} \left(\frac{1}{3x^2}\right)^2 = {}^9C_r 2^{9-r} \frac{1}{3^r} . x^{9-3r}$$

This term is independent of x if 9–3r = 0 i.e., r = 3.

Thus, 4th term is independent of x.

Sol.9 (A)

The binomial expansion of $\left(\frac{2}{3}x - \frac{3}{2}y\right)^{20}$ consists of 21 terms. Therefore $\left(\frac{20}{2}+1\right)$th term, i.e., 11th term is the middle term.

Hence the middle term = $T_{11} = {}^{20}C_{10}$

$$\left(\frac{2}{3}x\right)^{20-10} \left(-\frac{3}{2}y\right)^{10} = {}^{20}C_{10} x^{10} y^{10}$$

Sol.10 (A)

$$\frac{1-3x+x^2}{e^x} = (1 - 3x + x^2)e^{-x}$$

$$= (1 - 3x + x^2) \left(1 - x + \frac{x^2}{2!} - \frac{x^3}{3!} + \frac{x^4}{4!} - ......\right)$$

$$\therefore \text{Coefficient of } x^4 = \frac{1}{4!} + \frac{3}{3!} + \frac{1}{2!}$$

$$= \frac{1}{24} + \frac{1}{2} + \frac{1}{2} = \frac{25}{24}$$