Binomial Theorem Ex 18.2 Q16(i)

$$\left(\frac{3x^2}{2}-\frac{1}{3x}\right)^9$$

In expansion

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

$$= {}^9C_r\left(\frac{3}{2}\right)^{9-r}\left(x^{18-2r}\right)\left(\frac{-1}{3}\right)^r x^{-r}$$

Let T_{r+1} be independent of x

$$18-3r=0 \text{ or } r=6$$

$\therefore$ **Required term**

$$\Rightarrow \quad T_{r+1}=T_{6+1}=T_7={}^9C_6\left(\frac{3}{2}\right)^{9-6}\left(\frac{-1}{3}\right)^6 x^{18-3(6)}$$

$$=84\left(\frac{27}{8}\right)\left(\frac{1}{179}\right)x^0=\frac{7}{18}$$

Binomial Theorem Ex 18.2 Q16(ii)

$$\left(2x+\frac{1}{3x^2}\right)^9$$

4th term is independent of x

$$\binom{9}{3}(2x)^6\left(\frac{1}{3x^2}\right)^3=\binom{9}{3}\frac{64}{27}$$

Binomial Theorem Ex 18.2 Q16(iii)

$$T_{r+1}=(-1)^r\ {}^nC_r\left(2x^2\right)^{25-r}\left(\frac{3}{x^3}\right)^r=(-1)^r\ {}^nC_r 2^{25-r}3^r x^{50-2r-3r}$$

Term independent of $x = x^0$

$$\Rightarrow \quad x^{50-5r}=x^0 \Rightarrow 50-5r=0 \Rightarrow r=10$$

$$\therefore\ t_{11}=(-1)^{10}\ {}^{25}C_{10}2^{15}\times 3^{10}={}^{25}C_{10}2^{15}3^{10}$$

Binomial Theorem Ex 18.2 Q16(iv)

$$\left(3x-\frac{2}{x^2}\right)^{15}$$

$$T_{r+1}=(-1)^r\ {}^{15}C_r\,(3x)^{15-r}\left(\frac{2}{x^2}\right)^r$$

$$=(-1)^r\ {}^{15}C_r 3^{15-r}2^r x^{15-r-2r}$$

Term independent of $x \Rightarrow x^0$

$$\Rightarrow \quad x^{15-3r}=x^0$$

$$15-3r=0 \Rightarrow r=5$$

$$\therefore\ t_6=(-1)^5\ {}^{15}C_5 3^{10}2^5$$

$$=-\frac{15!}{5!10!}3^{10}2^5=-\frac{15\times14\times13\times12\times11}{120}3^{10}2^5$$

$$=-3003\times3^{10}\times2^5$$

Binomial Theorem Ex 18.2 Q16(v)

$$\left(\sqrt{\frac{x}{3}}+\frac{3}{2x^2}\right)^{10}$$

$$T_{r+1}=\ {}^{10}C_r\left(\sqrt{\frac{x}{3}}\right)^{10-r}\left(\frac{3}{2x^2}\right)^r$$

$$=\ {}^{10}C_r x^{5-\frac{r}{2}-2r}3^r\times3^{-5+\frac{r}{2}}\times2^{-r}$$

Independent of $x \Rightarrow x^0$

$$x^{\frac{10-r-4r}{r}}=x^0$$

$$10-5r=0$$

$$r=2$$

$$t_{3=}\ {}^{10}C_2 3^{2-5+1}2^{-2}$$

$$=\ {}^{10}C_2 3^{-2}2^{-2}$$

$$=\frac{10!}{2!8!}\times\frac{1}{36}=\frac{10\times9}{2\times36}=\frac{5}{4}$$

*********** END **********