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|  | SEQUENCE AND SERIES - SPECIAL SERIES Class XI |
| :---: | :---: |
| Q.17) | Find the sum to $n$ terms $1 \times 2 \times 3+2 \times 3 \times 4+3 \times 4 \times 5$......... $n$ terms. |
| Sol.17) | The general term of this series given by $\begin{aligned} & \text { an }=(n)(n+1)(n+2) \\ & a_{n}=n\left(n^{2}+3 n+2\right) \\ & a_{n}=n^{3}+3 n^{2}+2 n \\ & \text { Now, } \sum n=\sum a n \\ & \quad=\sum n^{3}+3 n^{2}+2 n \\ & \quad=\sum n^{3}+3 \sum n^{2}+2 \sum n \\ & =\frac{n^{2}(n+1)^{2}}{4}+\frac{3 n(n+1)(2 n+1)}{6}+\frac{2 n(n+1)}{2} \\ & =n(n+1)\left[\frac{n(n+1)}{4}+\frac{(2 n+1)}{2}+1\right] \\ & =n(n+1)\left[\frac{n^{2}+n+4 n+2+4}{4}\right] \\ & = \\ & =\frac{n(n+1)\left(n^{2}+5 n+6\right)}{4} \\ & S^{n}=\frac{(n+1)(n+2)(n+3)}{4} \text { ans. } \end{aligned}$ |
| Q.18) | Find the sum to $n$ terms $3 \times 1^{2}+5 \times 2^{2}+7 \times 3^{3}+\ldots \ldots . . . n$ terms |
| Sol.18) | General term of this series is $\begin{aligned} & a_{n}=(2 n+1)\left(n^{2}\right) \\ & a_{n}=\left(2 n^{3}+n^{2}\right) \\ & \text { Now, } S^{n}=\sum a n \\ & \quad=\sum\left(2 n^{3}+n^{2}\right) \\ & \quad=2 \sum n^{3}+\sum n^{2} \\ & =2 \frac{n^{2}(n+1)^{2}}{4}+\frac{n(n+1)(2 n+1)}{6} \\ & =n(n+1)\left[\frac{n(n+1)}{4}+\frac{(2 n+1)}{2}\right] \\ & =n(n+1)\left[\frac{3 n^{2}+3 n+2 n+1}{6}\right] \\ & = \\ & =\frac{n(n+1)\left(3 n^{2}+5 n+1\right)}{6} \\ & =\frac{n(n+1)\left(n^{2}+5 n+1\right)}{6} \\ & S^{n}=\frac{n(n+1)\left(3 n^{2}+5 n+1\right)}{6} \text { ans. } \end{aligned}$ |
| Q.19) | Find the sum $5^{2}+6^{2}+7^{2} \ldots \ldots \ldots . .20^{2}$. |
| Sol.19) | $\begin{aligned} & \text { Let } S=5^{2}+6^{2}+7^{2} \ldots . . . . .2^{2} . \\ &=\left(1^{2}+2^{2}+3^{2}+4^{2}+5^{2}+6^{2}+7^{2} \ldots \ldots \ldots . .20^{2}\right)-\left(1^{2}+2^{2}+3^{2}+4^{2}\right) \\ &= S=\left[\frac{n(n+1)(2 n+1)}{6}\right]-\left[\frac{n(n+1)(2 n+1)}{6}\right] \\ & \text { Here, put } n=20 \\ &= S=\left[\frac{20(20+1)(40+1)}{6}\right]-\left[\frac{4(4+1)(8+1)}{6}\right] \\ &= S=\frac{20(21)(41)}{6}-\frac{4(5)(9)}{6} \\ &= 2870-30=2840 \text { ans. } \end{aligned}$ |

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 StudiesToday| Q.20) | Find the sum to $n$ terms $\frac{1}{1 \times 2}+\frac{1}{2 \times 3}+\frac{1}{3 \times 4}+\ldots . . . . . n$ terms. |
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| Sol.20) | General term of the series is |
|  | $a_{n}=\frac{1}{n(n+1)}$ |
|  | Let $S_{n}=\frac{1}{1 \times 2}+\frac{1}{2 \times 3}+\frac{1}{3 \times 4}+\ldots \ldots \ldots . \frac{1}{n(n+1)}$ |
|  | $S_{n}=\left(\frac{1}{1}-\frac{1}{2}\right)+\left(\frac{1}{2}-\frac{1}{3}\right)+\left(\frac{1}{3}-\frac{1}{4}\right)+\ldots \ldots . .\left(\frac{1}{n}-\frac{1}{n+1}\right)$ |
|  | $S_{n}=\frac{1}{n}-\frac{1}{n+1}$ |
|  | $S_{n}=\frac{n+1-1}{n+1}$ |
| $\therefore S_{n}=\frac{n}{n+1}$ ans. |  |

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