Engineering Mathematics-II (BAS-203)
Unit 3 Sequence and Series
Tutorial 7

Que 1 Discuss the convergence of the sequences $\{a_n\}$ where

(i) $a_n = \frac{n+1}{n}$ *(ii)* $a_n = \sin\frac{1}{n}$ **[2021-22]** *(iii)* $a_n = \frac{2n}{n^2+1}$ **[2018-19]**

Que 2 Test the series $\sum_{n=1}^{\infty}\frac{1}{n}\sin\frac{1}{n}$ **[2021-22]**

Que 3 Test the Convergence of the series $\frac{1}{\sqrt{1}+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}+\cdots$

Que 4 Test the Convergence of the series $\frac{1}{1+2^{-1}}+\frac{2}{1+2^{-2}}+\frac{3}{1+2^{-3}}+\cdots$

Que 5 Test the Convergence of the series $\frac{\sqrt{2}-1}{3^3-1}+\frac{\sqrt{3}-1}{4^3-1}+\frac{\sqrt{4}-1}{5^3-1}+\cdots$

Que 6 Test the Convergence of the series $\frac{2^q}{1^P}+\frac{3^q}{2^P}+\frac{4^q}{3^P}+\cdots$

Que 7 Test the Convergence of the series

$(i)\sum_{n=1}^{\infty}\frac{2n^2+1}{3n^3+5n^2+6}$ $(ii)\sum_{n=1}^{\infty}\sqrt{n^3+1}-\sqrt{n^3-1}$ $(iii)\sum_{n=1}^{\infty}\frac{n!}{n^n}$ $(iv)\sum_{n=1}^{\infty}\frac{\sqrt{n}}{\sqrt{n^2+1}}x^n$ $(x>0)$

Que 8 Discuss the Convergence of the series $\frac{x}{1.2}+\frac{x^2}{3.4}+\frac{x^3}{5.6}+\frac{x^4}{7.8}+\cdots$. **[2021-22]**

Que 9 State D' Alembert test. Test the series $1+\frac{x}{2}+\frac{x^2}{5}+\frac{x^3}{10}+\cdots$ ... . **[2018-19]**

Que 10 Define Raabe's Test. Discuss the Convergence of the series $\frac{x}{1}+\frac{1}{2}\frac{x^3}{3}+\frac{1}{2}\frac{3}{4}\frac{x^5}{5}+\frac{1}{2}\frac{3}{4}\frac{5}{6}\frac{x^7}{7}+\ldots.(x>0)$

Que 11 Discuss the Convergence of the series $1+\frac{1}{2}x+\frac{1}{2}\frac{3}{4}x^2+\frac{1}{2}\frac{3}{4}\frac{5}{6}x^3+\ldots.(x>0)$

Que 12 Discuss the Convergence of the series $\frac{1}{1.2.3}+\frac{x}{4.5.6}+\frac{x^2}{7.8.9}+\ldots\ldots..$ **[2022-23]**

Que 13 Test the Convergence of the series $\frac{1^2}{4^2}+\frac{1^2}{4^2}\frac{5^2}{8^2}+\frac{1^2}{4^2}\frac{5^2}{8^2}\frac{9^2}{12^2}+\frac{1^2}{4^2}\frac{5^2}{8^2}\frac{9^2}{12^2}\frac{13^2}{16^2}+\ldots\ldots\ldots\ldots$

Que 14 Test the Convergence of the series $\frac{x^2}{2\log 2}+\frac{x^3}{3\log 3}+\frac{x^4}{4\log 4}+\ldots\ldots\ldots\ldots$

Answers

Ans 1 *(i)* Convergent *(ii)* Convergent *(iii)* Convergent

Ans 2 Convergent **Ans 3** Divergent **Ans 4** Divergent **Ans 5** Convergent

Ans 6 Convergent if $q > p+1$ and Divergent if $q \le p+1$

Ans 7 (i) Divergent (ii) Convergent(iii)Convergent (iv) Convergent if $x<1$ and Divergent if $x \ge 1$

Ans 8 Convergent if $x \le 1$ and Divergent if $x > 1$

Ans 9 Convergent if $x \le 1$ and Divergent if $x > 1$

Ans 10 Convergent if $x^2 \le 1$ and Divergent if $x^2 > 1$

Ans 11 Convergent if $x<1$ and Divergent if $x \ge 1$

Ans 12 Convergent if $x \le 1$ and Divergent if $x > 1$

Ans 13 Convergent

Ans 14 Convergent if $x<1$ and Divergent if $x \ge 1$