B.tech 1st year All Br
Even 2016-

First Term Examination, 2016 – 2017
B. Tech. II Semester

Sub. Name: Engg. Mathematics - II **Sub. Code: AHM – 2101**
Time: 1 Hr. 30 Min. **Max. Marks: 20**

Note - Attempt ALL Sections.

SECTION A **(1 x 5 = 5 marks)**

Note: ALL questions of this section are **COMPULSORY.**

Q.1. Consider the following series:

(i) $1-2+3-4+\ldots\ldots$ (ii) $1-(1/2)+(1/3)-(1/4)+\ldots\ldots\ldots$

(iii) $1-1+1-1+1-1+\ldots\ldots\ldots$

In which of the above series, is the Leibnitz test for testing the convergence of series applicable? Justify your answer.

Q.2. Find the n^{th} term of the series:

$$\frac{\alpha.\beta}{1.\gamma}x+\frac{\alpha(\alpha+1).\beta(\beta+1)}{1.2.\gamma(\gamma+1)}x^2+\frac{\alpha(\alpha+1)(\alpha+2).\beta(\beta+1)(\beta+2)}{1.2.3.\gamma(\gamma+1)(\gamma+2)}x^3+\ldots\ldots$$

Q.3. Test the convergence of the series: $1+2+3+4+\ldots\ldots$

Q.4. State Logarithmic test for finding the nature of a positive term infinite series.

Q.5. Test whether we can apply Cauchy condensation test in determining the convergence of the following series?

$$\frac{(\log 2)^2}{2^2}+\frac{(\log 3)^2}{3^2}+\frac{(\log 4)^2}{4^2}+\ldots\ldots+\frac{(\log n)^2}{n^2}+\ldots.$$

If yes, write your observations.

SECTION B (2 x 3 = 6 marks)

Note : Attempt any **THREE** questions.

Q.1. Test the convergence of the series: $\frac{\lfloor 2}{3}+\frac{\lfloor 3}{3^2}+\frac{\lfloor 4}{3^3}+\ldots\ldots$

Q.2. Prove that the series $\sum_{1}^{\infty}(1+\frac{1}{n})^{n^2}$ is divergent.

Q.3. Test the convergence of the series: $\frac{14}{1^3}+\frac{24}{2^3}+\frac{34}{3^3}+\ldots\ldots\ldots+\frac{10n+4}{n^3}+\ldots\ldots$

Q.4. Prove that the series $\frac{2^p}{1^q}+\frac{3^p}{2^q}+\frac{4^p}{3^q}+\ldots\ldots$ is convergent if q > p +1 and divergent otherwise. Here p and q are positive numbers.

SECTION C (3 x 3 = 9 marks)

Note : Attempt any **THREE** questions.

Q.1. Test the convergence of the series: $\frac{1}{1.2.3}+\frac{x}{4.5.6}+\frac{x^2}{7.8.9}+\ldots\ldots$

Q.2. Prove that the series $1+\frac{2^2}{3^2}+\frac{2^2.4^2}{3^2.5^2}+\frac{2^2.4^2.6^2}{3^2.5^2.7^2}+\ldots\ldots$ is divergent.

Q.3. Prove that the series

$$1+\frac{\alpha+1}{\beta+1}+\frac{(\alpha+1)(2\alpha+1)}{(\beta+1)(2\beta+1)}+\frac{(\alpha+1)(2\alpha+1)(3\alpha+1)}{(\beta+1)(2\beta+1)(3\beta+1)}+\ldots\ldots,\alpha>0,\beta>0$$

converges if $\beta>\alpha>0$ and diverges if $\alpha\geq\beta>0$

Q.4. Test the convergence of the series: $\frac{x}{1}+\frac{1}{2}.\frac{x^3}{3}+\frac{1.3}{2.4}.\frac{x^5}{5}+\frac{1.3.5}{2.4.6}.\frac{x^7}{7}+\ldots\ldots$