UUCMS. No. | | | | | | | | | | | | |

B.M.S COLLEGE FOR WOMEN
BENGALURU – 560004

III SEMESTER END EXAMINATION – JAN/FEB-2024

BSc-MATHEMATICS
REAL ANALYSIS -I AND ORDINARY DIFFERENTIAL EQUATIONS
(NEP Scheme 2021-22 onwards F+R)

Course Code: MAT3DSC03 **QP Code: 3015**
Duration: 2 ½ Hours **Max marks: 60**
Instructions: 1. Answer all the sections.

SECTION-A

I. Answer any SIX of the following. Each question carries TWO marks. (6x2=12)

1. Define limit of a sequence.
2. Test the convergence of the sequence $\left\{\frac{3n-4}{4n+3}\right\}$
3. State Raabe's test for the series of positive terms.
4. Test the convergence of the series $\sqrt{\frac{1}{4}}+\sqrt{\frac{2}{6}}+\sqrt{\frac{3}{8}}+\ldots$
5. Show that the equation $(x^2-ay)dx+(y^2-ax)dy=0$ is exact.
6. Solve $p^2-4p+3=0$ where $p=\frac{dy}{dx}$.
7. Find the particular integral of $\frac{d^2y}{dx^2}+y=\sin 3x$.
8. Verify the condition for Integrability for $(yz+2x)dx+(zx-2z)dy+(xy-2y)dz=0$

SECTION-B

II. Answer any FOUR of the following. Each question carries SIX marks. (4x6=24)

1. Discuss the behaviour of the sequence $\left\{\left(1+\frac{1}{n}\right)^n\right\}$.
2. Show that the sequence $\{a_n\}$ where $a_n=1+\frac{1}{1!}+\frac{1}{2!}+\frac{1}{3!}+\cdots+\frac{1}{n!}$ is convergent.
3. Prove that a monotonic decreasing sequence bounded below is convergent.
4. State and prove D-Alembert's ratio test.
5. Test the convergence of the series $1+\frac{1}{2}+\frac{1.3}{2.4}+\frac{1.3.5}{2.4.6}+\cdots$
6. Find the sum to infinity of the series $1+\frac{2}{6}+\frac{2.5}{6.12}+\frac{2.5.8}{6.12.18}+\cdots$

SECTION-C

III. Answer any FOUR of the following. Each question carries SIX marks. **(4x6=24)**

1. Solve $x\frac{dy}{dx} + (1-x)y = x^2y^2$.
2. Find the general and singular solution of $y = px + sin^{-1}p$.
3. Prove that the family of confocal conics $\frac{x^2}{\lambda+a^2} + \frac{y^2}{\lambda+b^2} = 1$ is self-orthogonal, λ is a parameter.
4. Solve $(D^2 - 2D + 4)y = e^x cosx$.
5. Solve $\frac{dx}{dt} - 7x + y = 0$; $\frac{dy}{dt} - 2x - 5y = 0$.
6. Solve $\frac{d^2y}{dx^2} + y = secx$ by the method of variation of parameters.

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