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**R-15**

**Code: 5GC14**

I B.Tech. I Semester Supplementary Examinations November 2023

**Engineering Mathematics-I**

(Common to All Branches)

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks)

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**UNIT-I**

- 1. a) Find the Orthogonal trajectories of the family of parabolas  $y^2 = 4ax$  7M
- b) Solve the differential equation  $(x+1)\frac{dy}{dx} - y = e^{3x}(x+1)^2$  7M

**OR**

- 2. a) A bacterial culture, growing exponentially, increases from 100 to 400 grams in 10 hours. How much was present after 3 hours 7M
- b) Find the Orthogonal trajectories of the family of curves  $y = ax$  7M

**UNIT-II**

- 3. Solve  $(D^2 + 4)y = x^2 + \cos 2x$  14M

**OR**

- 4. Using the method of variation of parameters, solve  $(D^2 + a^2)y = \sec ax$  14M

**UNIT-III**

- 5. a) Expand  $\sin x$ , by using Maclaurin's theorem. 7M
- b) Test of convergence of the series  $\frac{1}{1.2.3} + \frac{3}{2.3.4} + \frac{5}{3.4.5} + \dots \infty$  7M

**OR**

- 6. Discuss the convergence of the series  $1 - \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} - \frac{1}{\sqrt{4}} + \dots$  14M

**UNIT-IV**

- 7. Find the maximum and minimum values of  $x^3 + y^3 - 3axy$  14M

**OR**

- 8. Find the maximum and minimum values of  $x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$  14M

**UNIT-V**

- 9. Trace the curve  $x^3 + y^3 = 3axy$  14M

**OR**

- 10. Trace the curve  $r^2 = a^2 \cos 2\theta$  14M

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