

Please check that this question paper contains 9 questions and 2 printed pages within first ten minutes.

[Total No. of Questions: 09]

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Uni. Roll No. ....

Program: B.Tech (Batch 2018 onward)

Semester: 2

Name of Subject: Mathematics I

Subject Code: BSC-103

Paper ID: 15927

16-07-21(M)

**Time Allowed: 02 Hours**

**Max. Marks: 60**

**NOTE:**

- 1) Each question is of 10 marks.
- 2) Attempt any six questions out of nine
- 3) Any missing data may be assumed appropriately

**Q1.** Solve the differential equation  $\frac{dy}{dx} + y = 3e^x y^3$ .

**Q2.** (a) For what values of  $\lambda$  and  $\mu$  do the system of equations  $x + 2y + 3z = 6$ ,  
 $x + 3y + 5z = 9$  and  $2x + 5y + \lambda z = \mu$  have

(i) No solution (ii) a unique solution (iii) more than one solution ? (6 marks)

(b) Using Cayley Hamilton Theorem, Find the inverse of the matrix  $\begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix}$ . (4 marks)

**Q3.** (a) Solve  $(x - y^2)dx + 2xydy = 0$ . (5 marks)

(b) Solve  $y = 2px + y^2 p^3$  (5 marks)

**Q4.** (a) Test the convergence of the series  $\sum_{n=1}^{\infty} \frac{n}{(n^2 + 1)^2}$  using Cauchy Integral test. (6 marks)

(b) Find the Maclaurin series for  $f(x) = \cos x$ . (4 marks)

**Q5.** Discuss the convergence of the series  $\sum_{n=1}^{\infty} \frac{(n+1)}{n^3} x^n$ .

**Q6.** (a) Evaluate the integral  $\int_0^1 \frac{x}{\sqrt{1-x^5}} dx$  in terms of gamma function. (6 marks)

(b) Evaluate  $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2}$ .

(4 marks)

**Q7.** Solve by method of variation of parameter  $y'' - 2y' + y = e^x \log x$ .

**Q8.** Solve the differential equation  $x^2 \frac{d^2y}{dx^2} - 2x \frac{dy}{dx} + 2y = x^2 + \sin(\log x)$ .

**Q9.** Find the eigen values and eigen vectors of the matrix  $\begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ .

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