

Please check that this question paper contains _09_ questions and _02_ printed pages within first ten minutes.

[Total No. of Questions: 09]

[Total No. of Pages: 02]

Uni. Roll No.

Program: B.Tech. (Batch 2018 onward)

Semester:2

Name of Subject: Mathematics-I

Subject Code:BSC-103

Paper ID:15927

MORNING
19 SEP 2022

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

- 1) Parts A and B are compulsory
- 2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
- 3) Any missing data may be assumed appropriately

Part – A

[Marks: 02 each]

Q1.

- a) Define Exact differential equation . State necessary and sufficient condition for the differential equation to be exact.
- b) Test the convergence of the improper integral $\int_1^{\infty} \frac{dx}{x^2}$
- c) Evaluate $\lim_{x \rightarrow 0} \frac{xe^x - \log(1+x)}{x^2}$
- d) If λ is an eigen value of non singular matrix A, Prove that λ^{-1} is an eigen value of A^{-1} .
- e) Examine the convergence of the series $\frac{1}{5} + \frac{\sqrt{2}}{7} + \frac{\sqrt{3}}{9} + \frac{\sqrt{4}}{11} + \dots$
- f) Evaluate $\int_0^{\infty} e^{-x} x^{\frac{5}{2}} dx$

Part – B

[Marks: 04 each]

- Q2. Expand $\log \sin x$ in the powers of $(x-3)$.
- Q3. Solve the differential equation $y = 2px + y^2p^3$
- Q4. Evaluate $\int_0^{\frac{\pi}{2}} \sin^p x \cos^q x dx$

- Q5.** Test the convergence of $\sum \frac{(n-\log n)^n}{2^n n^n}$
- Q6.** Find the real value λ for which the system of equations $x + 2y + 3z = \lambda x$, $3x + y + 2z = \lambda y$, $2x + 3y + z = \lambda z$ have non-trivial solution.
- Q7.** Solve $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = \frac{e^{3x}}{x^2}$ by variation of parameter method.

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Part – C

[Marks: 12 each]

Q8. (i) Solve $\frac{dy}{dx} - \tan xy = -y^2 \sec^2 x$

OR

(ii) Solve $(D^3 + 2D^2 + D)y = x^2 e^x + \sin^2 x$

Q9. (i) Find a matrix P which transforms the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ into a diagonal form.

OR

(ii) Test the convergence of the series:

$$1 + \frac{2x}{2!} + \frac{3^2 x^2}{3!} + \frac{4^3 x^3}{4!} + \frac{5^4 x^4}{5!} + \dots$$
