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END SEMESTER EXAMINATION – APRIL/MAY 2026

MATHEMATICS - IV SEMESTER BSC

25BSC43A/B: MATHEMATICS IV

Time: 3 Hours. **Max. Marks: 80**

Instruction: *Answer should be written completely in English.*

SECTION - A

Answer any **FIVE** questions. Each question carries **TWO** marks. **(5X2=10)**

1. What is Gaussian integral?
2. Define subring.
3. Find C.F if $(D^2 + 4D + 4)y = e^{2x} - e^{-2x}$.
4. Find particular integral for the equation $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = cos^2x$.
5. Evaluate $L(e^{-5t}+5e^{-2t})$.
6. Find the Laplace transform of the function $e^{t-1}u(t-1)$.
7. Define Even function with an example.
8. Find a_0 for the function f(x)=x sinx.

SECTION - B

Answer any **SIX** questions. Each question carries **FIVE** marks. **(6X5=30)**

9. An element 'a' of a ring R is said to be idempotent if $a^2=a$. Show that the only idempotent elements of an integral domains are 0 and 1.
10. Let $f: R \to R'$ be a homomorphism of ring R and R' with Kernel K. The function f is one-one if and only if K= {0}.
11. Solve $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = 3e^{-4x}$.
12. Solve $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6y = (e^x + 1)^2$.
13. Find the Laplace transform of $t^2u(t-3)$.
14. Find the Inverse Laplace transform of $\frac{3s+1}{(s+1)^4}$.
15. Obtain the Fourier Series expansion for f(x) defined by $f(x)=\begin{cases} -k & -\pi < x < 0 \\ k & 0 < x < \pi \end{cases}$
16. Obtain the Fourier series of f(x) in $[0, 2\pi]$ defined by $f(x)=\begin{cases} x & 0 \le x \le \pi \\ 2\pi - x & \pi \le x \le 2\pi \end{cases}$

SECTION – C

Answer any **FIVE** questions. Each question carries **EIGHT** marks. **(5X8=40)**

17. Let $f: R \rightarrow R'$ be an isomorphism of rings R onto R'. Then show that
    i. If R is a commutative ring, then R' is also a commutative ring.
    ii. If R without zero divisors, then R' is also without zero divisors.
18. The equivalence class determined by a$\in R$, under the relation "Congruent modulo I" where I is an ideal, is the set a+I=$\{a+i, i \in I\}$.
19. Evaluate that if $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = x^2$.
20. Solve $sin^2xy'' + sinx\ cosx\ y' + 4y = 0$ by changing the independent variable.
21. Find the Laplace Transform of the following functions.
    i. $\frac{1-e^{-at}}{t}$
    ii. $\frac{sinat}{t}$
22. Find the Laplace Transform of the function $\frac{cosat-cosbt}{t}$.
23. Derive one-dimensional Heat equation using Fourier series.
24. Find the Fourier series of f(x)= $\begin{cases} -1 & -1 < x < 0 \\ 2x & 0 < x < 1 \end{cases}$