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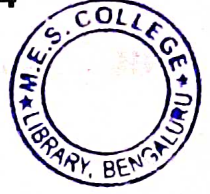
DCMT401

Reg. No.

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IV Semester B.Sc. Degree Examination, July/August- 2024

MATHEMATICS

Partial Differential Equations and Integral Transforms
(NEP Scheme)

Time : 2 ½ Hours

Maximum Marks : 60

Instructions to Candidates:Answer **All** the questions.**I. Answer any SIX of the following.****(6×2=12)**

1. Form the partial differential equation by eliminating arbitrary constants $z = ax + by + ab$.
2. Solve: $pq = 1$.
3. Solve: $(D^2 - DD' - 2D'^2)z = 0$
4. Find the particular integral of $(D^2 - DD' - 2D'^2)z = e^{x+2y}$
5. Find the Laplace transform of $e^{4t}\sin 5t$.
6. Find $L^{-1}\left\{\frac{s-3}{(s-3)^2+16}\right\}$.
7. Write the formula for half range Fourier Cosine series over the interval $(0, l)$.
8. Write formula for Fourier Cosine transforms.

II. Answer any THREE of the following.**(3×4=12)**

9. Form the partial differential equation by eliminating arbitrary function from $\phi(x^2 + y^2 + z^2, z^2 - 2xy) = 0$.
10. Solve: $x^2p + y^2q = z^2$.

[P.T.O.]



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11. Solve: $p^2 + q^2 = x + y$.
12. Solve: $z^2(p^2 + q^2 + 1) = 1$.
13. Solve: $p(1 + q^2) + (b - z)q = 0$ by Charpit's method.

III. Answer any **THREE** of the following.

(3×4=12)

14. Solve: $(D^2 - 2DD' - D'^2)z = e^{4x+2y}$.
15. Solve: $(D + D')(D + D' - 2)z = \cos(x + 2y)$.
16. Reduce the equation $\frac{\partial^2 z}{\partial x^2} = x^2 \left(\frac{\partial^2 z}{\partial y^2} \right)$ to a Canonical form.
17. Solve the wave equation $\frac{\partial^2 u}{\partial t^2} = a^2 \frac{\partial^2 u}{\partial x^2}$ under the condition $u = 0$ when $x = 0$ and $x = \pi$, $\frac{\partial u}{\partial t} = 0$. When $t = 0$ and $u(x, 0) = x$; $0 < x < \pi$.
18. An insulated rod of length 'l' has its ends A and B maintained at 0°C and 100°C respectively until steady state condition prevails. If B is suddenly reduced to 0°C and maintained at 0°C find the temperature at a distance x from A at time 't'.

IV. Answer any **THREE** of the following.

(3×4=12)

19. Find
 - i) $L[\sin 5t \cos 2t]$
 - ii) $L[e^{2t} \cos 3t]$
20. If $f(t) = t^2$, $0 < t < 2$ and f is periodic of period 2 then find $L[f(t)]$.
21. Find the Laplace transform of $t^2 \cos at$.
22. Verify the convolution theorem for the function $f(t) = t$; $g(t) = \cos t$.
23. Find inverse Laplace transform of $\frac{1}{s(s+1)(s+2)}$.



V. Answer any **THREE** of the following.

(3×4=12)

24. Obtain the Fourier series for $f(x) = |x|$ in $(-\pi, \pi)$.

25. Obtain the Fourier series of the function in $(0, 2\pi)$ defined by

$$f(x) = \begin{cases} x; & 0 \leq x < \pi \\ 2\pi - x; & \pi \leq x \leq 2\pi \end{cases}$$

26. Obtain Fourier half range sine series of $f(x) = (x - 1)^2$ in $(0, 1)$.

27. Express $f(x) = \begin{cases} 1, & |x| \leq 1 \\ 0, & |x| > 1 \end{cases}$ as a Fourier integral expansion.

28. Find the Fourier sine transform of $f(x) = e^{-ax}$, $a > 0$.
