GATE

GATE ALL BRANCHES CRASH COURSE 2025

ENGINEERING MATHEMATICS
Differential Equation

DPP

Q1 The equation y(x) =c_1 cos2x +c_2 sin2x is solution of-
(A) y'' + 2y = 0
(B) y'' + 4y = 0
(C) y'' + 6y = 0
(D) y'' + 8y = 0

Q2 Solution of the equation $\frac{dy}{dx} = \frac{x^2+2}{y}$ is-
(A) $y^2 = \frac{2}{3}x^3 + 4x + c$
(B) $y^2 = \frac{2}{3}x^3 - 4x + c$
(C) $y^2 = \frac{-2}{3}x^3 + 4x + c$
(D) $y^2 = \frac{2}{3}x^2 + 4x + c$

Q3 The solution of the equation $\frac{dx}{dt} = x^2 - 2x + 2$ is-
(A) x =1 – tan (t+c)
(B) x =1 + tan (t+c)
(C) x = –1 + tan (t+c)
(D) x = –1 – tan (t+c)

Q4 The solution of the equation $y' = \frac{2xy}{x^2-y^2}$ is-
(A) $x^2 + y^2 = cy$
(B) $x^2 + y^2 = cx^3$
(C) $x^2 + y^2 = cx$
(D) $x^2 + y^2 = cy^3$

Q5 The integrating factor of the differential equation, $y^2dx + xydy = 0$ is-
(A) y (B) –y
(C) $\frac{-1}{y}$ (D) $\frac{1}{y}$

Q6 The solution of the equation $z' - xz = -x$ when $z(0) = -4$ is-
(A) $z(x) = 1 - 5.e^{\frac{x^2}{2}}$
(B) $z(x) = 1 - 5.e^{\frac{-x^2}{2}}$
(C) $z(x) = 1 + 3e^{\frac{x^2}{2}}$
(D) $z(x) = 2 - 6 \cdot e^{\frac{-x^2}{2}}$

Q7 A bacteria culture is known to grow at a rate proportional of the amount present. After one hour, 1000 strands of bacteria are observed. And after 4 hours, 3000 stands are observed. The approximate strands of bacteria originally in the culture is_____. (Enter in integer).

Q8 If $\frac{dQ}{dt} + \frac{2}{10+2t}Q = 4;\ Q(2) = 100,$ then
(A) $Q(t) = \frac{4t^2+40t+1304}{2t+10}$
(B) $Q(t) = \frac{4t^2+40t-1304}{2t-10}$
(C) $Q(t) = \frac{4t^2-40t+1304}{2t+10}$
(D) $Q(t) = \frac{4t^2-40t+1304}{2t-10}$

Q9 The solution of $y^1 + y = \sin x$ is $y = c \cdot e^{-x} + \frac{\sin x - \cos x}{\alpha}$. The value of 'a' is_____.

Q10 The steady-state value of the current given by the governing $\frac{dI}{dt} + 50I = 5$ when I = 0 at t = 0 is_____units.

Q11 The solution of $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 5y = 0$ is.
(A) $y = c_1e^{-x} \cdot \sin 2x + c_2 \cos 2x \cdot e^{-x}$
(B) $y = c_1e^{x} \cos x - c_2ce^{x} \cdot \sin x$
(C) $y = c_1 \cdot e^{-2x} \sin x + c_2 \cdot e^{-2x} \cdot \cos x$
(D) $y = c_1e^{2x} \sin x - c_2e^{2x} \cos x$

Q12 The solution of $\frac{d^4y}{dx^4} - 9\frac{d^2y}{dx^2} + 20y = 0$ is.
(A) $y = c_1 \cosh 2x + c_2 \sinh 2x + c_3 \cosh \sqrt{5x} + c_4 \sin \sqrt{5x}$.
(B) $y = c_1 \cos 2x + c_2 \sin 2x + c_3 \cos \sqrt{5x} + c_4 \sin \sqrt{5x}$.
(C) $y = c_1 \cosh 2x + c_2 \sinh 2x + c_3 \cos(\sqrt{5x}) + c_4 \sin(\sqrt{5x})$.
(D) $y = c_1 \cos 2x + c_2 \sin 2x + c_3 \cos(\sqrt{5x}) + c_4 \sin(\sqrt{5x})$.

Q13 The particular Integral of the DE y'' –y' –2y = $4x^2$ is-

(A) $2x^2 - 2x + 3$
(B) $-2x^2 - 2x + 3$
(C) $-2x^2 + 2x - 3$
(D) $2x^2 - 2x - 3$

Q14 For the DE $\frac{d^2y}{dx^2} + 4y = \tan 2x$, The value of Wronskian is_____.
(Enter in integer).

Q15 The solution of
$x^2 \cdot \frac{d^2y}{dx^2} - x \cdot \frac{dy}{dx} + y = \log_e x$ is-
(A) $y = (c_1 + c_2 \log_e x) + \log_e x + 2$
(B) $y = (c_1 + c_2 \cdot x \cdot \log_e x) + \log_e x + 2$
(C) $y = \left(c_1 + c_2 \cdot x^2 \cdot \log_e x\right) + x \cdot \log_e x + 2$
(D) $y = (c_1 + c_2 \log_e x)x + \log_e x + 2$

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Answer Key

Q1	(B)
Q2	(A)
Q3	(B)
Q4	(A, C)
Q5	(D)
Q6	(A)
Q7	680~710
Q8	(A)
Q9	2~2
Q10	0.1~0.1
Q11	(C)
Q12	(A)
Q13	(C)
Q14	2~2
Q15	(D)