Que. A

1. solve $(x+y)dx + (x-y)dy = 0$
2. solve $(3x^2-y)dx - x\,dy = 0$
3. solve $(x^2+y)dx + (y^3+x)dy = 0$
4. solve $(3x^3-y)dx + (y-x)dy = 0$
5. solve $(x^3+y)dx + (y^2+x)dy = 0$
6. solve $(4x^3-y)dx + (y^2-x)dy = 0$
7. solve $(5x^2+y)dx + (y^3+x)dy = 0$
8. solve $(5x^4-y)dx - x\,dy = 0$
9. solve $(2xy+y^3)dx + (x^2+3xy^2)dy = 0$
10. solve $(x-2y+5)dx - (2x+y-1)dy = 0$
11. solve $(x+y-2)dx - (y-x-4)dy = 0$
12. solve $2xy\,dx + (x^2+3y^2)dy = 0$
13. solve $(2x-y)dx - (x-y)dy = 0$

Que. B

1. solve $x^2y\,dx - (x^3+y^3)dy = 0$
2. solve $(x^2-3xy+2y^2)dx + (3x^2-2xy)dy = 0$
3. solve $(xy-2y^2)dx - (x^2-3xy)dy = 0$
4. solve $(y^2-xy)dx + x^2dy = 0$
5. solve $-y^2dx + (xy+x^2)dy = 0$
6. solve $(x^2+y^2+x)dx + xy\,dy = 0$
7. solve $(x^2+y^2+1)dx - 2xy\,dy = 0$
8. solve $(x+4y^3)dy - y\,dx = 0$
9. solve $(y^4+2y)dx + (xy^3+2y^4-4x)dy = 0$
10. solve $y(1-xy)dx - x(1+xy)dy = 0$
11. solve $(3y^2+4x)dx + 3xy\,dy = 0$
12. solve $(3xy-y^2)dx + (x^2-xy)dy = 0$
13. solve $y(xy+2x^2y^2)dx + x(xy-x^2y^2)dy = 0$
14. solve $(x^4+y^4)dx - xy^3\,dy = 0$

Que. C (1) solve: $\frac{dy}{dx} + \frac{y}{x} = x^5$

(2) solve: $\frac{dy}{dx} + \frac{y}{x} = x^3$

(3) solve: $\frac{dy}{dx} - \frac{y}{x} = x^4$

(4) solve: $\frac{dy}{dx} - \frac{y}{x} = x^7$

(5) solve: $\frac{dy}{dx} + y \cot x = \operatorname{cosec} x$

(6) solve: $\frac{dy}{dx} + y \tan x = \cos^2 x$

(7) solve: $\frac{dy}{dx} - \frac{y}{x+1} = e^x(x+1)$

(8) solve: $\frac{dy}{dx} + \left(\frac{2x}{1+x^2}\right)y = \frac{\cos x}{1+x^2}$

(9) solve: $\frac{dy}{dx} - \frac{y}{x} = x^2$

Que. D (1) A body originally at 80°C cools to 60°C in 20 min the temperature of air being 40°C, what will be the temperature of body after 40 min from original?

(2) A body temperature originally at 100°C is placed in a room whose temperature is 20°C & cools to 60°C in 5 min. what will be its temperature after 10 min?

③ A body at temperature 100°C is placed in a room whose temperature is 20°C & cools to 60°C in 5 min. Find temperature after 15 min?

Que. E ① Find orthogonal trajectory for $y = mx$

② Find orthogonal trajectory of the family of $xy = c$

③ Find orthogonal trajectory of family $y^2 = 4ax$

④ Find orthogonal trajectory of family $x^2 + y^2 = c^2$

⑤ Find orthogonal trajectory of $x^2 + 2y^2 = 2c^2$

⑥ Find orthogonal trajectory of $y = ax^2$.

Que. F ① A resistance of 250 Ω & inductance of 640 H are connected in a series with battery of 500 V. Find the current in a circuit if $i = 0$ at $t = 0$.

② A resistance of 200 Ω & inductance of 20 H are connected in a series with battery of 100 V. Find the current in a circuit if $i = 0$ at $t = 0$.

③ A resistance of 200 Ω & inductance of 600 H are connected in series with battery of 400 V. Find the current in the circuit if $i = 0$ at $t = 0$.

Que. G ① A circuit consist of resistance 'R Ω & consider capacitance of 'C' farad connected e.m.f 'E' volts If $\frac{q}{c}$ is the voltage of condencer at time 't' then at $q = 0$ at $t = 0$ show that $\frac{q}{c} = E(1 - e^{-t/RC})$

② A circuit consist of Resistance of 50 Ω & capacitance of 0.3 F connected in series with battery of 100 V Find charge passing through circuit if $q=0$ at $t=0$.

③ A circuit consist of Resistance of 25 Ω & capacitance of 0.5 F connected in series with battery of 14 V Find the charge passing through circuit if $q=0$ at $t=0$

Que. H ① A steam pipe 40cm in diameter contains steam at 150°C & its protected with a covering of 10 cm thick for which $K = 0.0012$. If the temperature of outer surface of covering is 30°C, Find the temperature at a distance of 25 cm from centre of pipe under steady - state condition.

② A pipe 20cm in diameter contain steam at 150°C & protected with covering of 5cm thick for which $K = 0.0025$. If the temperature of the outer surface of covering is 40°C. Find the temperature at a distance of 12.5cm from centre of pipe?

③ A pipe 20cm in diameter contain steam at 150°C & is protected with covering 10cm thick for which $K = 0.0012$. If the temperature of outer surface covering is 30°C. Find the temperature at a distance of 15cm from centre of pipe?

Que.(I) ① Evaluate: $\int_0^{\pi} x \cdot \sin^7 x \cdot \cos^4 x \, dx$

② Evaluate: $\int_0^{\pi} x \cdot \sin^5 x \cdot \cos^2 x \, dx$

③ Evaluate: $\int_0^{\pi} x \cdot \sin^3 x \cdot \cos^2 x \, dx$

④ Evaluate: $\int_0^{\pi} x \cdot \sin^5 x \cdot \cos^4 x \, dx$

⑤ Evaluate: $\int_0^{\pi} x \cdot \sin^7 x \cdot \cos^2 x \, dx$

⑥ Evaluate: $\int_0^{\pi} x \cdot \sin^7 x \cdot \cos^6 x \, dx$

⑦ Evaluate: $\int_0^{\pi} x \cdot \sin^9 x \cdot \cos^2 x \, dx$

Que.(J) ① Evaluate: $\int_0^{\infty} e^{-x} \cdot x^{10} \, dx$

② Evaluate: $\int_0^{\infty} e^{-t} \cdot t^7 \, dt$

③ Evaluate: $\int_0^{\infty} e^{-t} \cdot t^{3/2} \, dt$

④ Evaluate: $\int_0^{\infty} e^{-t} \cdot t^{5/2} \, dt$

⑤ Evaluate: $\int_0^{\infty} e^{-t} \cdot t^{7/2} \, dt$

⑥ Evaluate: $\int_0^{\infty} e^{-t} \cdot t^4 \, dt$

(7) Evaluate: $\int_0^\infty e^{-\sqrt{x}} \cdot \sqrt[4]{x}\, dx$

(8) Evaluate: $\int_0^\infty e^{-\sqrt{x}} \cdot \sqrt{x}\, dx$

(9) Evaluate: $\int_0^\infty e^{-\sqrt{x}} \cdot \sqrt[3]{x}\, dx$

(10) Evaluate: $\int_0^\infty e^{-\sqrt[3]{x}} \cdot \sqrt{x}\, dx$

(11) Evaluate: $\int_0^\infty e^{-\sqrt{x}} \cdot \sqrt[4]{x^2}\, dx$

(12) Evaluate: $\int_0^\infty e^{-\sqrt[3]{x}} \cdot \sqrt[4]{x^2}\, dx$

(13) Evaluate: $\int_0^\infty e^{-x^4}\, dx$

Que.(K) (1) Find the value of $B(2,3)$

(2) Find the value of $B(5/2, 3)$

(3) Find the value of $B(3/2, 5/2)$

(4) Find the value of $B(3/2, 7/2)$

(5) Find the value of $B(5/2, 7/2)$

(6) Evaluate: $\int_0^1 x^3 (1-\sqrt{x})^5\, dx$

(7) Evaluate: $\int_0^1 x^4 (1-\sqrt{x})^6 \, dx$

(8) Evaluate: $\int_0^1 x^5 (1-\sqrt{x})^7 \, dx$

Que. L (1) Show that $\int_0^1 \frac{x^\alpha - 1}{\log x} \, dx = \log(\alpha+1)$

(2) Show that $\int_0^\infty \left(\frac{1-e^{-\alpha x}}{x}\right) e^{-x} \, dx = \log(\alpha+1)$

(3) Show that $\int_0^\infty \frac{e^{-\alpha x} \cdot \sin x}{x} \, dx = \frac{\pi}{2} - \tan^{-1}\alpha$

(4) Show that $\int_0^\infty \frac{1-\cos\alpha x}{x^2} \, dx = \frac{\pi\alpha}{2}$

assume that $\int_0^\infty \frac{\sin x}{x} \, dx = \frac{\pi}{2}$

(5) Show that $\int_0^\infty \frac{e^{-x} - e^{-\alpha x}}{x \sec x} \, dx = \frac{1}{2} \log\left(\frac{\alpha^2+1}{2}\right)$

(6) Find $\frac{dI}{d\alpha}$ if $I(\alpha) = \int_{\pi/6\alpha}^{\pi/2\alpha} \frac{\sin\alpha x}{x} \, dx$

(7) Find $\frac{dI}{d\alpha}$ if $I(\alpha) = \int_a^{a^2} \frac{\sin\alpha x}{x} \, dx$