12th

physics hints and solutions

: HINTS AND SOLUTIONS :

3 **(b)**

$e = n\frac{dB}{dt}$

$\therefore dt = \frac{nAB}{e} = \frac{50 \times 100 \times 10^{-4} \times 2 \times 10^{-2}}{5}$

$= 0.1s$

4 **(c)**

$e = \frac{d\phi}{dt} = \frac{1 - 0.1}{0.1} = \frac{0.9}{0.1} = 9V.$

$I = \frac{e}{R} = \frac{1}{100} = 0.09\ A$

5 **(c)**

magnetic flux linked with coil $\phi = Bna$

$d\phi = \phi_2 - \phi_1 = (B_2 - B_1)n\ A$

$= (0.1 - 0.05) \times 100 \times (10 \times 5 \times 10^{-4})$

$= 250 \times 10^{-4}$

emf induced in coil $e = \frac{d\varphi}{dt} = \frac{d\varphi}{dt} = \frac{250 \times 10^{-4}}{0.05}$

$= 0.5V$

6 **(d)**

ϕ=nBA, so it is independt in density.

11 **(b)**

$e = -L\frac{dI}{dt} = -5 \times 2 = -10\ V$

12 **(a)**

$E = \frac{1}{2}LI^2 = \frac{1}{2} \times 50 \times 10^{-3} \times (4)^2$

$= \frac{1}{2} \times 50 \times 10^{-3} \times 16$

$= 50 \times 10^{-3} \times 8 = 0.4J$

14 **(a)**

Inductors are connected in parellel then the equiva

$\frac{1}{l_p} = \frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_3} = \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{3}{3} = 1$

$L_p = 1H$

16 **(d)**

$V_p = 200\ \text{volt}, V_S = 25\ \text{volt}, I_s = 2A, I_p = ?$

$\frac{V_s}{V_p} = \frac{I_p}{I_s}$

$I_p \frac{V_s}{V_p} \times I_s = \frac{25}{200} \times 2 = 0.25\ A = 250mA$

17 **(a)**

$V_s = \frac{n_s}{n_p} \times V_p = \frac{5000}{500} \times 20 = 200V$ frequency remains unchanged

18 **(d)**

$\frac{V_s}{V_p} = \frac{n_s}{n_p}; \frac{V_s}{V_p} = \frac{I_p}{I_s}; \frac{I_p}{I_s} = \frac{n_s}{n_p} = \frac{4}{5}$

19 (a)

$\phi = MI, d\phi = M\ dl$

$M = \frac{d\phi}{di} = \frac{1.6}{8} = 0.2H$

20 (b)

$e = -M\frac{dI}{dt} \Rightarrow 15 \times 10^{-3} = M \times \frac{3}{10}$

$\Rightarrow M = 0.05H$

21 (d)

$L = \frac{\phi}{I} = \frac{50}{5} = 10H$

22 (c)

$M = \frac{e}{di/dt} = e.dt/di = \frac{1000 \times 0.01}{2} = 5H$

23 (b)

$e_0 = nAB\omega = naB.2\pi n$

$= 2 \times 7 \times 10^{-5} \times 2 \times \frac{22}{7} \times 100 = 88\ mV$

Question Numbers – 1, 7,8,9,10,15,25 – All conceptual understanding based

: HINTS AND SOLUTIONS :

1 (b)
The isomeric primary alcohols of $C_4H_{10}O$ are :
(1) Butan-1-ol
(2) 3-Methyl propan-1-ol

4 (a)
$$CH_3CHO + 2[H] \xrightarrow[\Delta]{Na(Hg)+H_2O} CH_3CH_2OH$$

5 (c)
$$CH_3 - \overset{\overset{\large O}{\|}}{C} - OH + 4[H] \xrightarrow[\Delta]{LiAlH_4} CH_3CH_2OH + H_2O$$

8 (c)
Formaldehyde + Grignard Reagent → 1^0 alcohol

10 (a)
Y on oxidation gives acetone.
Therefore Y is Propan-2-ol.
X on hydration gives Propan-2-ol. Therefore X is Propene.

11 (a)
During breaking of O – H bond, order of reactivity is $1^0 > 2^0 > 3^0$.

12 (a)
$$-CH_2OH \overset{[O]}{\rightarrow} -CHO$$

18 (c)
1 double bond ⇒ Sp^2hybridised.

All rest other other Questions are conceptually based

Mathematics hints and solutions

1 (b)

2 (c)

$$I = \int \frac{dx}{1+e^{-x}}$$
$$= \int \frac{e^x}{1+e^x}\, dx$$
$$= \log(1+e^x) + c$$

3 (d)

$$I = \int \frac{e^x(1+x)}{\cos^2(xe^x)}\, dx$$
Put $xe^x \ dx = dt$
$$e^x(1+x)dx = dt$$
$$I = \int \sec^2 t \ dt$$
$$= \tan t + c$$
$$= \tan(xe^x) + c$$

4 (b)

$$I = \int x^2 e^x dx$$
$$= x^2e^x - \int 2xe^x dx$$
$$= x^2e^x - 2xe^x + 2e^x + c$$
$$= e^x(x^2 - 2x + 2) + c$$

5 (b)

$$I = \int e^x(\sin x + \cos x)dx$$
$$= \int e^x \left[\sin x + \frac{d}{dx}(\sin x)\right] dx$$
$$= e^x \sin x + c$$

6 (b)

$$I = \int e^x \left(\log x + \frac{1}{x}\right) dx$$
$$= e^x \left(\log x + \frac{d}{dx}(\log x)\right) dx$$
$$= e^x \log x + c$$

7 (c)

$$I = \int e^x \left(\frac{x+2}{(x+3)^2}\right) dx$$
$$= \int e^x \left(\frac{1}{x+3} - \frac{1}{(x+3)^2}\right) dx$$
$$= \int e^x \left(\frac{1}{x+3} + \frac{d}{dx}\left(\frac{1}{(x+3)^2}\right)\right) dx$$
$$= \frac{e^x}{x+3} + c$$

8 (b)

$$I = \int (\sin(\log x) + \cos(\log x) \ dx$$
Put $\log x = t \quad dx = e^t \ dt$
$$I = \int e^t(\sin t + \cos t) \ dt$$

$= \int e^t \left(\sin t + \frac{d}{dx}(\cos t)\right) dt$
$= e^t \sin t + c$
$= x \sin(\log x) + c$

9 (b)

$\mathrm{I} = \int \left(\frac{1}{\log x} - \frac{1}{(\log x)^2}\right) dx$

Put $\log x = t \quad \therefore x = e^t dt$

$\mathrm{I} = \int e^t \left(\frac{1}{t} - \frac{1}{t^2}\right) dt$

$= e^t \left(\frac{1}{t}\right) + c$

$= x \left(\frac{1}{\log x}\right) + c$

10 (a)

$\mathrm{I} = \int e^{\sin^{-1} x} \left(\frac{x + \sqrt{1-x^2}}{\sqrt{1-x^2}}\right) dx$

Put $\sin^{-1} x = t$

$\frac{dx}{\sqrt{1-x^2}} = dt \; and \; x = \sin t$

$\mathrm{I} = \int e^t \left(\sin t + \sqrt{1 - \sin^2 t}\right) dt$

$\mathrm{I} = \int e^t (\sin t + \cos t) dt$

$\mathrm{I} = e^t \sin t + c$

$\mathrm{I} = x e^{\sin^{-1} x} + c$

11 (c)

$\mathrm{I} = \int e^{\tan^{-1} x} \left(\frac{1 + x + x^2}{1 + x^2}\right) dx$

Put $\tan^{-1} = t \quad \therefore \frac{1}{1+x^2} \, dx = dt$

$= \int e^t (1 + \tan^2 t + \tan t) dt$

$= \int e^t (\tan t + \sec^2 t) \; dt$

$= e^t \tan t + c$

$= xe\text{^} \tan^{-1} + c$

12 (d)

$\mathrm{I} = \int \sqrt{4 - 9x^2} \; dx$

$= \int 3 \sqrt{\left(\frac{2}{3}\right)^2 - x^2} \; dx$

$= 3 \left\{\frac{x}{2} \sqrt{\left(\frac{2}{3}\right)^2 - x^2} + \frac{\frac{4}{9}}{2} \sin^{-1}\left(\frac{x}{\frac{2}{3}}\right)\right\} + c$

$= \left\{\frac{x}{2} \sqrt{4 - 9x^2} + \frac{2}{3} \sin^{-1}\left(\frac{3x}{2}\right)\right\} + c$

13 (a)

$\mathrm{I} = \int \frac{dx}{x - x^2}$

$= \int \frac{1}{x(1-x)} \; dx$

Let $1 = A(x) + B(1 - x)$

$\mathrm{A} = 1, \quad B = 1$

$\mathrm{I} = \int \frac{x + (1-x)}{x(1-x)}\, dx$

$= \int \frac{1}{1-x} dx + \int \frac{1}{x} dx$

$= -\log(1-x) + \log x + c$

$= \log x - \log(1-x) + c$

14 (a)

$\mathrm{I} = \int \frac{dx}{x^2 - 5x + 6}$

$= \int \frac{1}{(x-2)(x-3)}\, dx$

Let $1 = A(x-2) + B(x-3)$

$\mathrm{A} = 1, \quad B = -1$

$\mathrm{I} = \int \frac{(x-2)-(x-3)}{(x-2)(x-3)}\, dx$

$= \int \frac{1}{x-3} dx - \int \frac{1}{x-2}\, dx$

$= \log(x-3) - \log(x-2) + c$

$= \log\left(\frac{(x-3)}{(x-2)}\right) + c$

15 (d)

$\mathrm{I} = \int \frac{\sin x}{\cos x(4 + \cos x)}\, dx$

Put $\cos x = t \Rightarrow \sin x\, dx = -dt$

$\mathrm{I} = \int \frac{-dt}{t(4+t)}$

By Partial Fraction

$\mathrm{I} = \int \left(\frac{-1}{4t} + \frac{1}{4(4+t)}\right) dt$

$\mathrm{I} = \frac{1}{4}(\log|4+t| - \log|t|) + c$

$\mathrm{I} = \frac{1}{4}\log\left|\frac{4 + \cos x}{\cos x}\right| + c$

16 (c)

$\mathrm{I} = \int \frac{\log x}{x(2 + \log x)(3 + \log x)} dx$

Put $\log x = t \Rightarrow \frac{dx}{x} = dt$

$\mathrm{I} = \int \frac{t}{(t+2)(t+3)} dt$

By Partial Fraction

$\mathrm{t} = A(t+3) + B(t+2)$

Put $t = -3 \Rightarrow B = 3$

$\mathrm{I} = \int \left(\frac{-2}{t+2} + \frac{3}{t+3}\right) dt$

$\mathrm{I} = -2\log|t+2| + 3\log|t+3| + c$

$\mathrm{I} = 3\log|\log x + 3| - 2\log|\log x + 2| + c$

17 (a)

$\mathrm{I} = \int \frac{5x+2}{x^2 - 3x + 2} dx$

$\mathrm{I} = \int \frac{5x+2}{(x-1)(x-2)} dx$

By Partial Fraction

$5x + 2 = A(x-2) + B(x-1)$
Put $x = 1 \Rightarrow A = -7$
Put $x = 2 \Rightarrow B = 12$
Put $x = 2 \Rightarrow B = 12$
$\mathrm{I} = \int \left(\frac{12}{x-2} - \frac{7}{x-1}\right) dx$
$\mathrm{I} = 12 \log | x-2 | -7 \log | x-1 | + c$

18 (c)
$\mathrm{I} = \int e^x \left(\frac{x}{(x+1)^2}\right) dx$
$= \int e^x \left(\frac{1}{x+1} - \frac{1}{(x+1)}\right) dx$
$= \int e^x \left[\frac{1}{x+1} + \frac{d}{dx}\left(\frac{1}{(x+1)^2}\right)\right] dx$
$= \frac{e^x}{x+1} + c$

19 (a)
$\mathrm{I} = \int e^x (x^2 + 2x + 5)\ dx$
$= \int e^x \left[(x^2+5) + \frac{d}{dx}(x^2+5)\right]$
$= e^x (x^2 + 5) + c$

20 (c)
$\mathrm{I} = \int e^x \sin dx$
$= e^x \sin x - \int e^x \cos x dx$
$\mathrm{I} = e^x \sin x - e^x \cos x - \int e^x \sin x\ dx$
$2\mathrm{I} = e^x (\sin x - \cos x) + c$
$\mathrm{I} = \frac{e^x}{2}(\sin x - \cos x) + c$

21 (a)
$\mathrm{I} = \int \frac{1}{2 + 3\sin^2 x}\ dx$
$= \int \frac{\sec^2 x}{2\sec^2 x + 3\tan^2 x}\ dx$
$= \int \frac{\sec^2 x}{5\tan^2 x + 2}$
Put $\tan x = t$, $\sec^2 x\ dx = dt$
$\mathrm{I} = \int \frac{1}{5t^2 + 2}\ dt$
$= \frac{1}{5}\int \frac{1}{t^2 + \frac{2}{5}}\ dt$
$= \frac{1}{5} . \frac{\sqrt{5}}{\sqrt{2}} \tan^{-1}\left(\frac{\sqrt{5}t}{\sqrt{2}}\right) + c$
$= \frac{1}{\sqrt{10}} \tan^{-1}\left(\frac{\sqrt{5}\tan x}{\sqrt{2}}\right) + c$

22 (a)
$\int \frac{sdx}{5 + 4\cos x}$
$Put \tan x/2 = t,$

$$dx=\frac{2dt}{1+t^2}, \cos x=\frac{1-t^2}{1+t^2}$$

$$=\int \frac{\frac{2dt}{1+t^2}}{\frac{5+5+t^2 4(1-t^2)}{1+t^2}}=2\int \frac{1}{9+t^2}dt$$

$$=\frac{2}{3}\times \tan^{-1}\left(\frac{t}{3}\right)+c=\frac{2}{3}\tan^{-1}(\frac{1}{3}\tan\frac{x}{2})+c$$

23 (b)

$$\log x=t$$

$$\frac{1}{x}dx=dt$$

$$\mathrm{I}=\int \log t\ dt$$

$$=t.[\log t-1]+c$$

(Intergration by part)

$$=\log x[\log(\log x)-1]+c$$

24 (c)

$$\mathrm{I}=\int \frac{1}{x^2+4x-5}\ dx$$

$$=\int \frac{1}{(x+2)^2-3^2}\ dx$$

$$\frac{1}{6}\log \mid \frac{x-1}{x+5}\mid +c$$

25 (d)

$$\mathrm{I}=\int x^n \log x\ dx$$

$$\mathrm{I}=(\log x)\ \frac{x^{n+1}}{n+1}-\int \frac{1}{x}\frac{x^{n+1}}{n+1}dx$$

$$\mathrm{I}=(\log x)\ \frac{x^{n+1}}{n+1}-\frac{1}{n+1}\int x^n dx$$

$$\mathrm{I}=\frac{(\log x)x^{n+1}}{n+1}-\frac{x^{n+1}}{(n+1)^2}+c$$

: HINTS AND SOLUTIONS :