Que. 2 (b)

\[ S = 1000, \quad n = 4, \quad i = 0.03 \]

\[ p = \frac{S}{(1+i)^n} = \frac{1000}{(1+0.03)^4} \]

\[ p = 888.5 \text{ Rs.} \]

\[ \text{ii)} \quad \text{Discount} = \text{F.V} - \text{P.V} \\
\quad = 1000 - 888.5 \\
\quad = 111.5 \text{ Rs.} \]

\[ \text{iii)} \quad p = 700, \quad n = 4 \\
\quad \frac{p}{S} = \left(1+i\right)^n \\
\quad i = \left(\frac{1000}{700}\right)^{1/4} - 1 \\
\quad i = 0.0933 = 9.33\% \]

Que. 3 (b)

For filter 1, 
- dia = 2 m 
- length = 5 m 
- peripheral area = \(2\pi R = 31.416 \text{ m}^2\)

For filter 2,
- cost = Rs. 30000 per 50 m\(^2\) in 1974

\[
\begin{array}{c|c|c}
\text{Cost of filter 2 in 1984} & \text{Cost of filter 2 in 1974} & \text{CI in 1984} \\
\hline
\text{CI in 1974} & \text{CI in 1984} \\
\end{array}
\]

\[= 50,000 \times \frac{182}{151} \]

\[= 36,158.94 \text{ per } 50 \text{ m}^2 \text{ of area.} \]

Use six-tenth rule,
Cost of Filter \( = \frac{\text{cost of Filter 1}}{\frac{\text{PF area of Filter 1}}{\text{PF area of Filter 2}}} \)

\( = 27,360.50 \) Rs.

**Q. 4. (b)**

\( C_v = 10,000 \) l, \( V_o = 2000 \) l,

\( n = 10 \) yrs, \( i = 0.07 \), \( K = \frac{C_v}{\ln(1+i)^{10}} \)

\[ K = \frac{10,000}{\ln(1+0.07)^{10}} \]

\[ K = 18,272 \text{ Rs.} \]

**Q. 5**

Components | Costs (Rs.)
--- | ---
Purchased Equip. cost, E | 100,000
Purchased Equip. installn. cost (30% E) | 30,000
Instrument (28% E) | 28,000
Piping (31% E) | 31,000
Electrical (10% E) | 10,000
Building (22% E) | 22,000
Yard improvement (10% E) | 10,000
Service facility (55% E) | 35,000

Direct plant cost | 2,95,000

\[ \text{Total Direct + Indirect plant} = 3,61,000 \]
Contingency fees (5% D.I) 18,050
Contingency fees (10% O.I) 36,100

Fixed capital invest = D + I + Contractor + Contingency
= 3,61,000 + 18,050 + 36,100
= 4,15,150

Total capital investment = working + fixed capital
T.CI = W.CI + F.CI
T.CI = 20.1% T.CI + F.CI

0.8 T.CI = F.CI
T.CI = \[
\frac{4,15,150}{0.8} = 5,18,937 \text{ Rs.}
\] (Ang 3)

\text{G.G. 4.1)}

Rate of Return = \frac{\text{Avg. net profit}}{\text{Total cap. invest.}} \times 100

Avg. net profit = value of heat saved -
(oper. cost + fixed charges)

Design I,
Avg. net profit = 10,000 - (7,500 + 2,500)
= 6,750

\[
\text{ROR} = \frac{67500}{2150,000} \times 100 = 31 \%
\]

Design II,
Avg. net profit = 92,500

\[
\text{ROR} = 23.12 \%
\]
Design III
Avg net profit = 1,82,500

ROR = 20.5\%.

Design II
Avg net profit = 1,27,500

ROR = 10.6\%.

Since all four designs have above 10.6\% ROR, so we have to do an analysis on return on incremental basis.

Compare design II with I,
Annual increment on ROR = \frac{\text{Difference in net profit of II & I on ROR}}{\text{diff in initial investment} \times 100}

\begin{align*}
\text{diff in initial investment} &= 2,50,000 - 6,75,000 \\
\text{and net profit} &= 1,27,500 - 1,82,500 \\
\text{ROR} &= 16.6\%.
\end{align*}

Since design II has 16.6\% of incremental return on investment than design I, design II is rejected. Design II is preferred.

Now, compare III with II
Annual increment on ROR = \frac{1,27,500 - 92,500}{62,500 - 6,75,000} \times 100

Design III is preferred.

Compare IV with II
Annual increment on ROR = \frac{1,27,500 - 92,500}{650,000 - 4,00,000} \times 100

\begin{align*}
\text{ROR} &= 14\%.
\end{align*}

Hence, among all 4, Design IV will be preferred.