Q1.

Let x be the no. of hours of use of the operation/year.

Let TC_A = Total equivalent annual cost of Alt. A

TC_B = Total equivalent annual cost of Alt. B

TC_A = C.R cost + Maint. cost/year + Current cost/year

$C.R(i)_A = (P-F)(A/P, i, n) + F \times i$

$\qquad = (4990-700)(A/P, i, 4) + 700 \times 0.1$

$\qquad = \$1395$

$TC_A = \$1395 + 420 + 2.94(x) = 1815 + 2.94(x)$ — ①

$TC_B = CR(i)_B + [\text{cost of diesel + Maint. + wages}] \times \text{No. of hrs.}$

$CR(i)_B = (P-R)(A/P, i, n) + F \cdot i$

$\qquad = (1925-0)(A/P, 10\%, 4) + 0 \times i$

$\qquad = \$607.28$

$TC_B = \$607.28 + (1.47 + 0.53 + 2.8) \times x = 607.28 + 4.8x$ — ②

Now if we equal TC_A & TC_B, i.e, ①=② then we will get x, which is the value of no. of hours of operation of Alt. A & B @ which cost are equal. $TC_A = TC_B$

$\qquad 1815 + 2.94(x) = 607.28 + 4.8x$ $\qquad \boxed{x = 649 \text{ hrs}}$

From the chart it is very clear that if the actual no. of hrs of op. is less than 649 hrs, Alt B is economical. If it is more than 649 hrs, Alt. A is economical.

when the no. of hrs of operation is 100, Alt. B is economical & preferred
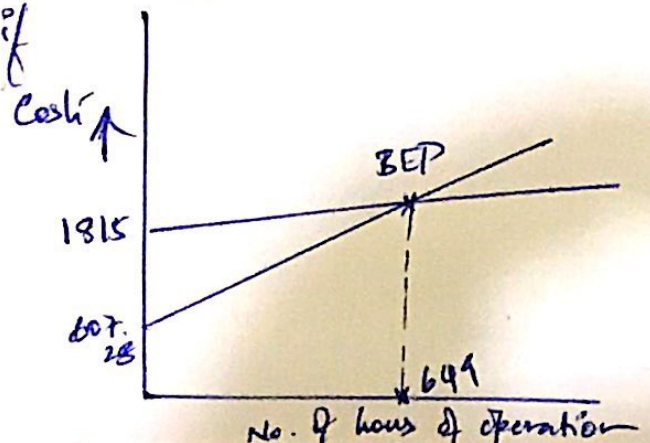
Q2.

Let x be the no. of hours of operations of each engine per year

TC_1 = Total equivalent annual cost of gasoline engine

TC_2 = Total equivalent annual cost of diesel engine

TC_3 = Total equivalent annual cost of butane engine.

$$TC_1 = 2000 \, (A/P, 15\%, 5) + 200 + 3.6X$$
$$= 796.64 + 3.6X \quad\text{————— ①}$$

$$TC_2 = 2800 \, (A/P, 15\%, 5) + 240 + 3.3X$$
$$= 1075.3 + 3.3X \quad\text{————— ②}$$

$$TC_3 = 3300 \, (A/P, 15\%, 5) + 315 + 2.9X$$
$$= 1299.5 + 2.9X \quad\text{————— ③}$$

The B.E b/w the alternatives can be found by equating the alternatives at a time in pairs.
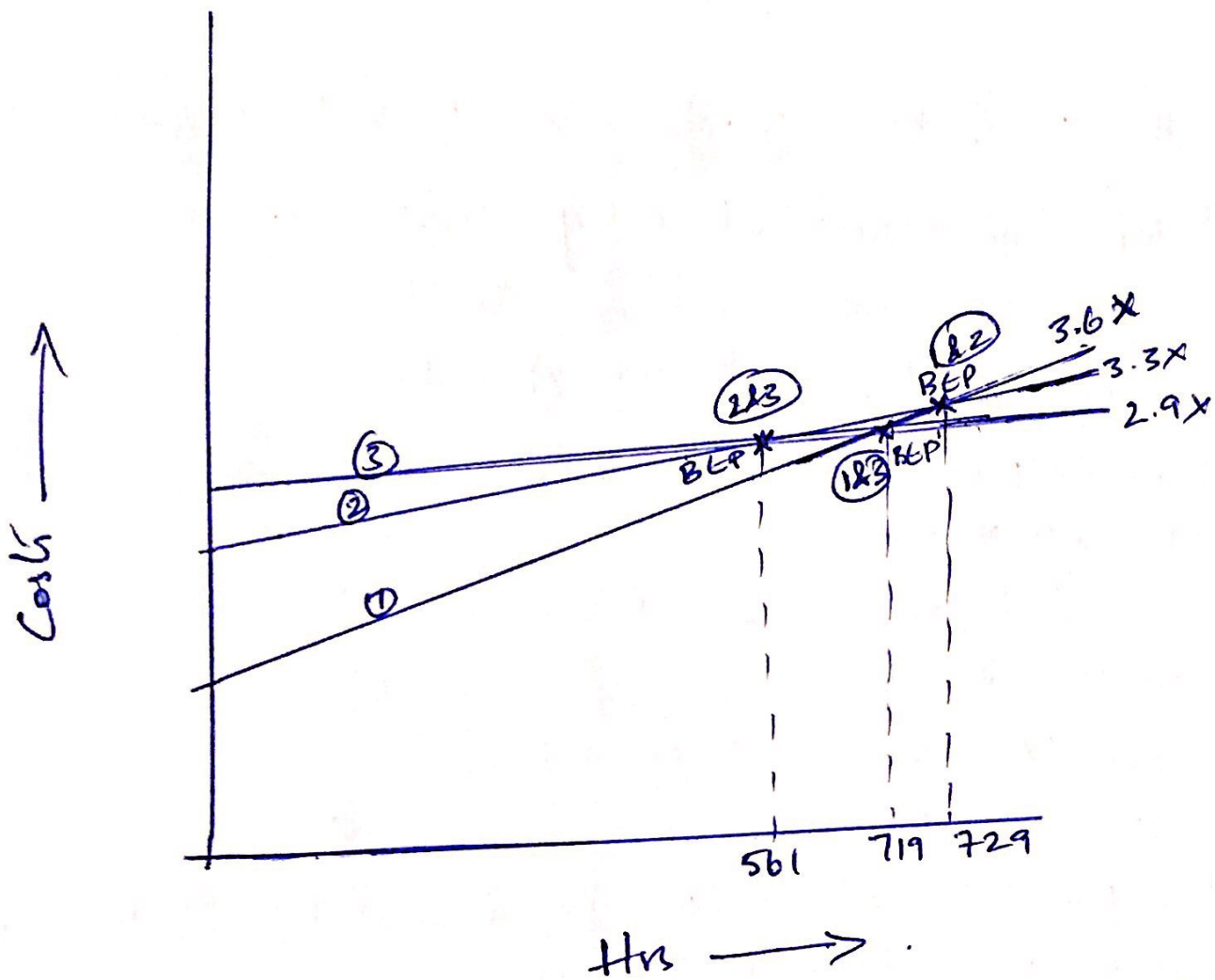
① & ②
$$TC_1 = TC_2$$
$$796.64 + 3.6X = 1075.3 + 3.3X$$
$$X = 928.86 = \underline{\underline{929 \text{ hrs.}}}$$

② & ③
$$TC_2 = TC_3$$
$$1075.3 + 3.3X = 1299.5 + 2.9X$$
$$X = \underline{\underline{561 \text{ hrs.}}}$$

③ & ①
$$TC_3 = TC_1$$
$$1299.5 + 2.9X = 796.64 + 3.6X$$
$$X = \underline{\underline{719 \text{ hrs.}}}$$

Upto 719 hrs, go for Alt. 1. – Gasoline engine

Greater than 719 hrs, go for Alt-3 – Butane engine

Do not go for diesel engine (Alt-2)