Tutorial 4

Resistive load - 6kW, 230V, 3ø

30A Type C MCB

$Z_E = 0.6\,\Omega$

(i) Determine Z_s (R_1+R_2) → Table 17A

$2.5+1.5 \rightarrow 19.51$

$1.38 \rightarrow$ PVC

$Z_s = Z_E + (R_1+R_2)\,\Omega$

$= Z_E + (1.38 \times 19.51 \times 3)$

$= 0.6 + [1.38 \times 19.51 \times 10^{-3} \times 3]$

$= 0.6808\,\Omega$

(ii) $I_F = \frac{230}{0.6808}$

$= 337.84\,A$

Type B table

$t = 0.027s$

(iii) longest length it can run to comply with I_s

$I_F = 300A$ (I_s trip)

$Z_s = \frac{230}{300A}$

$= 0.7667\,\Omega$

$Z_s = 0.6 + [1.38 \times 19.51 \times 10^{-3} \times L]$

$L = \frac{0.7667 - 0.6}{(1.38 \times 19.51 \times 10^{-3})}$

$= 6.19m$

(iv) $K^2S^2 \geq I^2t$

~~$(300)^2(5)$~~ $K^2S^2 = (115^2)(1.5^2)$ $I^2t = (337.838)^2(0.027)$

$= 29756$ $= 3084$

2) $V = 230V$, R_A 100Ω $R_1 = 0.5Ω$
$R_B = 20Ω$ $R_2 = 0.5Ω$

$I_f = \frac{230}{100+20+0.5+0.5}$
$= 1.9A$

V_t (without bonding) $= 1.9(R_2+R_A)$
$= 190.95V$

V_t (with bonding) $= 1.9(R_2)$
$= 1.9 \times 0.5$
$= 0.95V$

3) Select smallest CPC for highest Ω/m to get highest resistance

230V
1.5kW
Amm^2
25A BS 88
45m
$Z_E = 0.8Ω$

(i) $1.5mm^2$

(ii) $Z_s = 0.8 + (1.38 \times 16.71 \times 10^{-3} \times 45)$
$= 1.84Ω$

$I_f = \frac{230}{1.84} = 125A$

$K^2S^2 \geq I^2t$

$125^2(2) = 31250$

$(115)^2 \times 1.5^2 = 29756.25$
$29756.25 < 31250$
CPC fails

a) Not protected