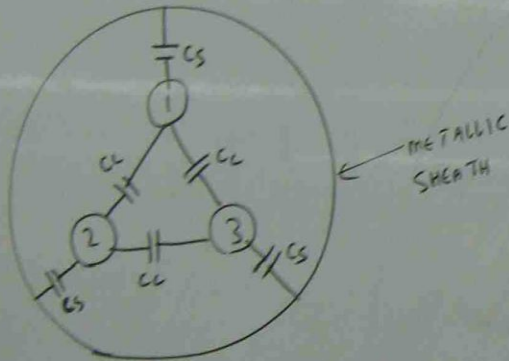


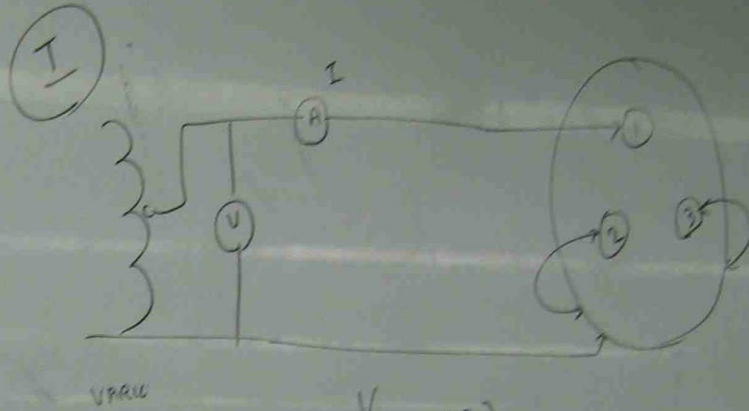
# CAPACITANCE IN UNDER GROUND CABLE

## < CAPACITANCE IN 3 CORE BELT TYPE CABLE >



$C_c$  = CAPACITANCE BETWEEN CORE TO CORE

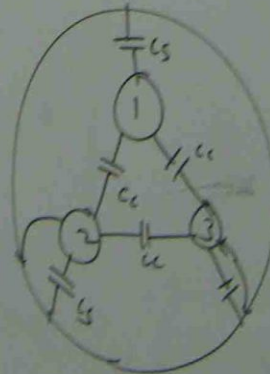
$C_s$  = CAPACITANCE BETWEEN CORE TO SHEATH



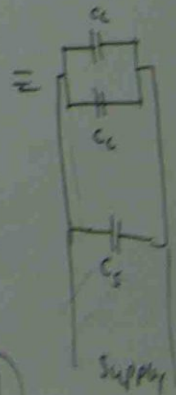
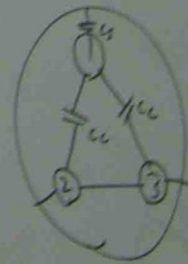
$$X_c = \frac{V}{I} \text{ (ohm)}$$

$$X_c = \frac{1}{2\pi f C} \rightarrow C = \frac{1}{2\pi f X_c}$$

total  
(1)



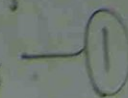
$\equiv$



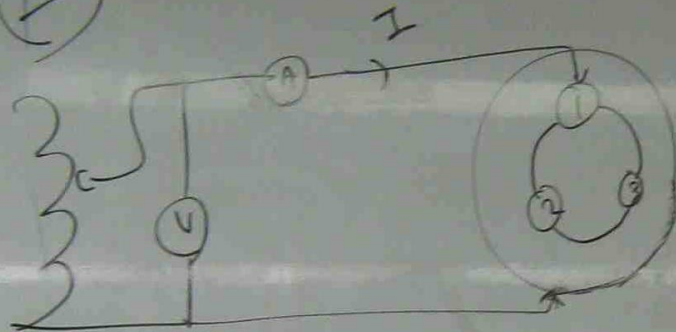
$$C_{\text{total}} = C_c + C_c + C_s$$

$$C_{\text{total}} = 2C_c + C_s$$

(1)

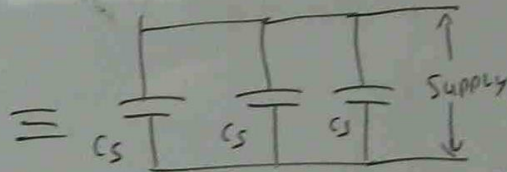
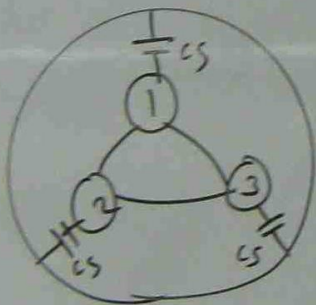


(11)



$$X_C = \frac{V}{I}$$

$$C_{total(2)} = \frac{1}{2\pi f X_C}$$

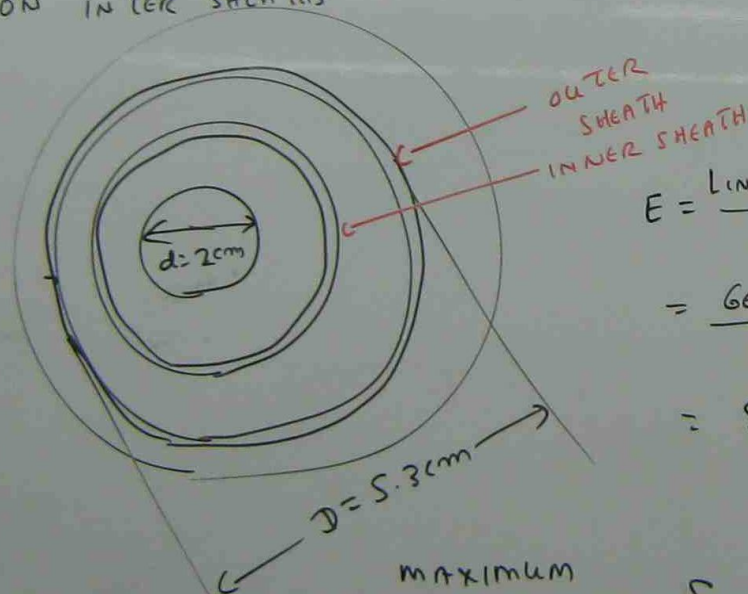


$$C_{total(2)} = 3 C_s \text{ --- } (2)$$

ph

A SINGLE CORE 66 KV CABLE HAS A CONDUCTOR DIAMETER OF 2cm AND A SHEATH OF INSIDE DIAMETER 5.3cm.

FIND THE MAXIMUM STRESS. IF TWO INTER SHEATHS ARE USED, FIND THE BEST POSITION, THE MAXIMUM STRESS AND THE VOLTAGE ON INTER SHEATHS



$$E = \frac{\text{LINE VOLTAGE} \times \sqrt{2}}{\sqrt{3}}$$

$$= \frac{66 \text{ kV} \times 1.4142}{1.7321}$$

$$= 53.8 \text{ kV}$$

maximum  
STRESS  
WITHOUT SHEATH

$$S_{\text{max}} = \frac{E}{\frac{1}{2} d \ln \frac{D}{d}}$$

$$= \frac{53.8}{\frac{1}{2} \times 2 \text{ cm} \ln \frac{5.3}{2}}$$

$$= \frac{53.8}{\ln 2.65} = \frac{53.8}{0.974} = 55.2 \text{ kV/cm}$$

By inserting the inner sheath, the stress can be reduced

$$L = \sqrt[3]{\frac{P}{d}} = \sqrt[3]{\frac{5.3}{2}} = \sqrt[3]{2.65} = 2.65^{0.333} = 1.384$$

$$\begin{aligned} \text{MAXIMUM STRESS WITH SHEATH} &= \frac{S_{\text{MAX WITHOUT SHEATH}}}{\frac{1}{3}(1 + \alpha + \alpha^2)} \\ &= \frac{55.2}{\frac{1}{3}(1 + 1.384 + 1.384^2)} \\ &= 38.7 \text{ kV/cm} \end{aligned}$$

fxc

Q. IN TESTING OF AN UNDERGROUND CABLE, CONDUCTOR 2 & 3 ARE CONNECTED, BY MEASUREMENT OF CAPACITANCE BETWEEN CONDUCTOR 1 AND 2-3 COMBINATION IS 6  $\mu F$ .

WHEN ALL CONDUCTORS ARE CONNECTED, THE MEASURED CAPACITANCE IS 4  $\mu F$ . CALCULATE THE CAPACITANCE BETWEEN CONDUCTORS AND THE CAPACITANCE BETWEEN CONDUCTOR AND SHEATH.

$$2C_c + C_s = 6 \mu F \quad \text{--- (1)}$$

$$3C_s = 4 \mu F \quad \text{--- (2)}$$

$$C_s = \frac{4}{3} = 1.33 \mu F$$

$$2C_c + 1.33 = 6$$

$$C_c = \frac{6 - 1.33}{2} = 2.33 \mu F$$

