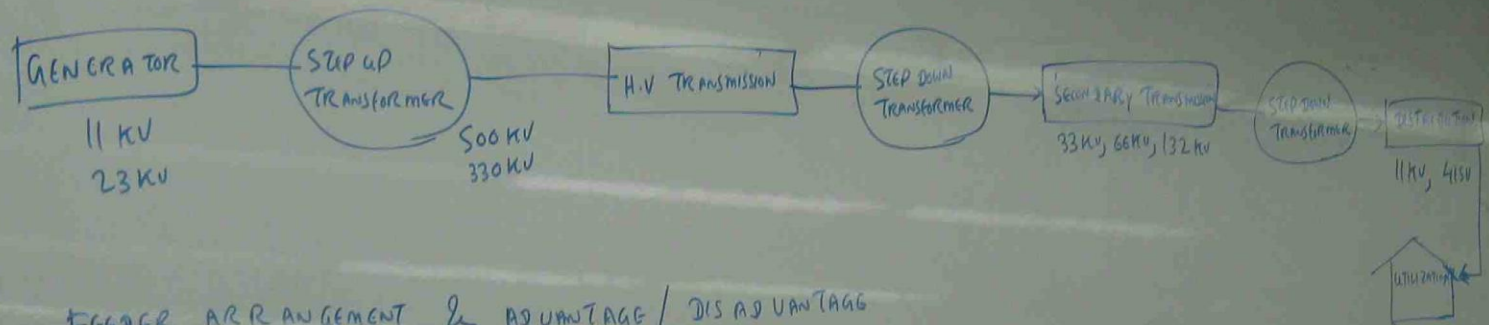
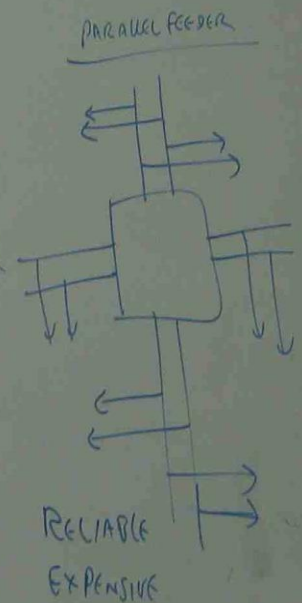
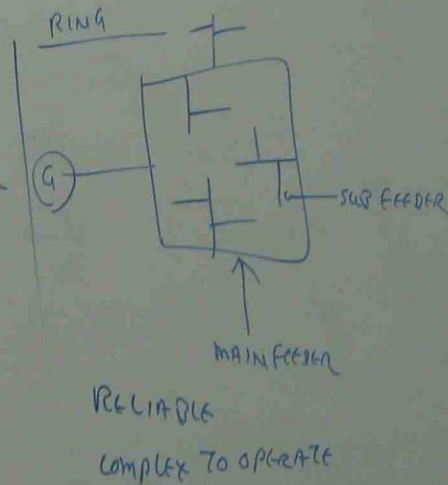
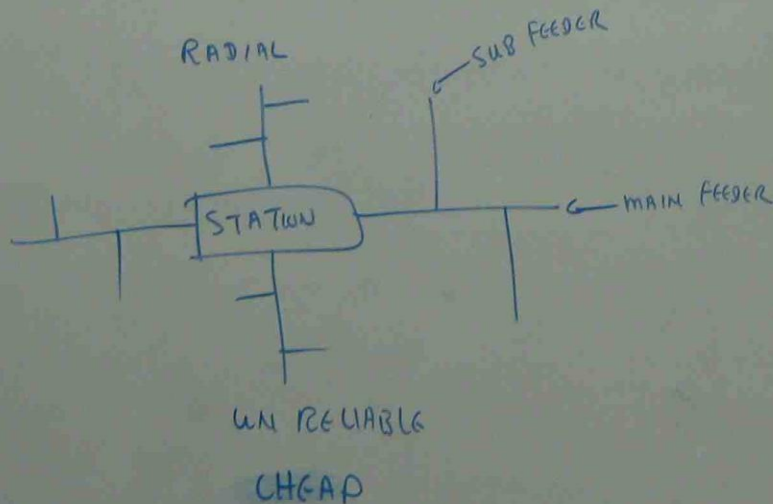




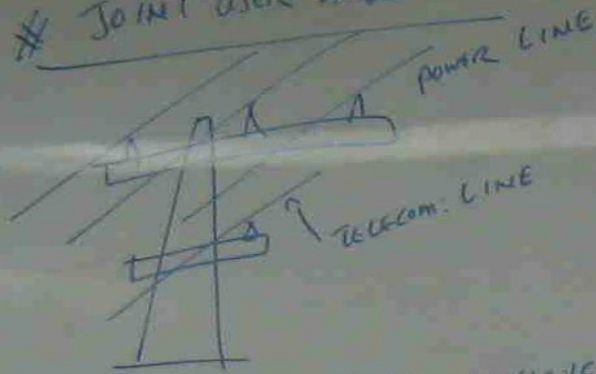
## BLOCK DIAGRAM of power system



## FEEDER ARRANGEMENT & ADVANTAGE / DISADVANTAGE



## # JOINT USER AGREEMENT



POWER COMPANY AND TELECOMMUNICATION COMPANY

SHARE ONE POLE TO INSTALL THEIR SERVICES.

- AGREE ON DISTANCE BETWEEN POWER LINE AND TELECOM. LINE

## XX MAINTENANCE OF POLES

- EVERY 6 MONTHS TO YEAR, VISUAL INSPECTION IS TO BE DONE FOR POLE. COATING THE POLE WITH THIN LAYER OF CHARCOAL.
- 2 TO 3 YEARS, SOIL AROUND THE POLE IS TO BE INSPECTED. INFESTATION OF INSECTS NEED TO BE CHECKED.

- ✗ INTERPRETATION OF UNDER GROUND CABLE → SEE NOTES
- ✗ STAYING THE POLE, ESSENTIAL COMPONENTS → SEE NOTES
- ✗ THREE GENERAL METHODS OF VOLTAGE CONTROL → SEE NOTES

pb A 3  $\phi$  load 200 MVA, 50 Hz is to have its power factor improved from 0.75 to 9. Calculate the size of capacitor bank required if supply voltage is 415 V. Sketch the connection. → SEE POWER SYSTEM ANALYSIS (OR) POWER SYSTEM OPERATION NOTES.

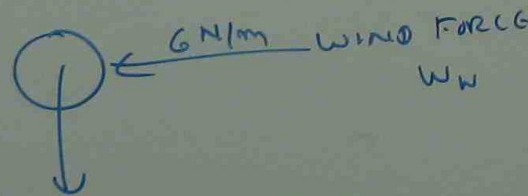
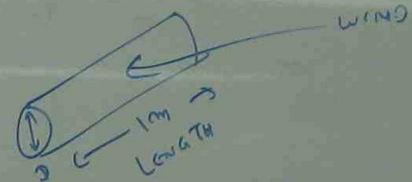
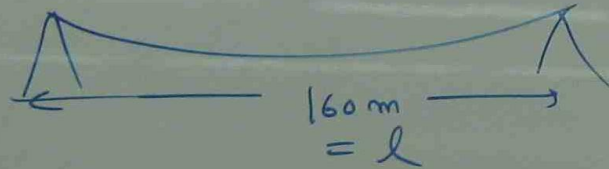
pb A transformer supplies a group of feeders which have individual maximum demands of 2.5, 2.4, 4.3 and 1.6 MVA. If diversity factor is 1.82, determine the maximum demand on transformer.

$$\begin{aligned}
 \text{Maximum Demand on Transformer} &= \frac{\text{Sum of individual maximum demands}}{\text{Diversity Factor}} \\
 &= \frac{2.5 + 2.4 + 4.3 + 1.6}{1.82} = 5.93 \text{ MVA}
 \end{aligned}$$

ph

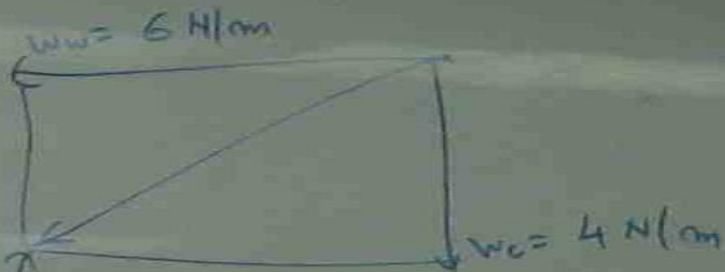
THE CONDUCTOR IS TO BE ERECTED OVER A 160 m SPAN  
HAS AN EQUIVALENT WEIGHT OF 4 N/m. DIAMETER 12 mm  
AND ULTIMATE TENSILE STRENGTH OF 33 kN.

DETERMINE THE SAG WHICH MUST BE PROVIDED ON ERECTION  
IF IT IS DESIRED TO ALLOW FOR WIND LOADING 500 Pa  
AND SAFETY FACTOR 3.5.



$$= \text{WIND PRESSURE} \times \text{AREA SUBJECT TO WIND}$$
$$= 500 \times \frac{12}{1000} \times 1$$

$$= 6\text{ N/m}$$



$$w_T = \sqrt{w_v^2 + w_w^2} = \sqrt{4^2 + 6^2} = 7.2 \text{ N/m}$$

$$SAG = \frac{w_T l^2}{8T}$$

$$= \frac{7.2 \times 160^2}{8 \times \left( \frac{33000}{3.5} \right)}$$

$$= 2.443 \text{ m}$$

Prob A 3 PHASE, 11KV OVER HEAD RURAL LINE IS TO BE ERECTED BETWEEN POINTS A AND B. THE ROUTE OF THE WOODEN POLE LINE IS STRAIT AND HAS SOLE RESISTANCE TO MOVEMENT IS GOOD STANDARD PIN INSULATORS ON SINGLE WOODEN CROSS ARM FORMS PART OF THE LINE INSULATION.

- NOMINATE GROUND CLEARANCE YOU WOULD RECOMMEND AND INDICATE DETAILS RELATING TO THIS DECISION
- THE MAXIMUM CONDUCTOR DESIGN SAG HAS BEEN SET AT 1.0m. INDICATE SUITABLE POLE PLANTING DEPTH AND DETERMINE TOTAL LENGTH OF POLE
- IF THE TERMINATION POLES ARE LOCATED AT A AND B, WHAT WILL BE THE MOST ECONOMICAL NUMBER OF POLES FOR POWER LINE OF 3 km

$$\text{MASS} / 106 \text{ mm} = 43 \text{ kg}$$

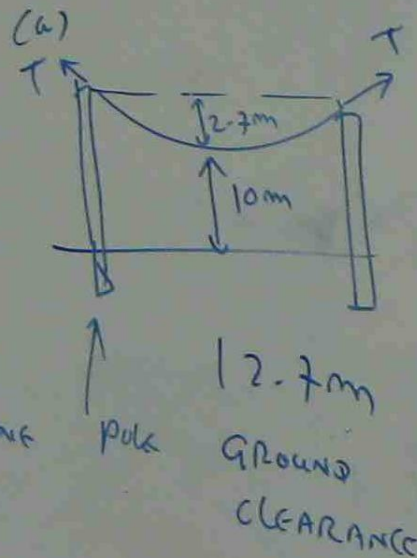
$$\text{WIND LOAD} = 750 \text{ Pa}$$

$$\text{EQUIVALENT DIAMETER} = 16 \text{ mm}$$

$$\text{DESIGN TENSION} = 6 \text{ kN}$$

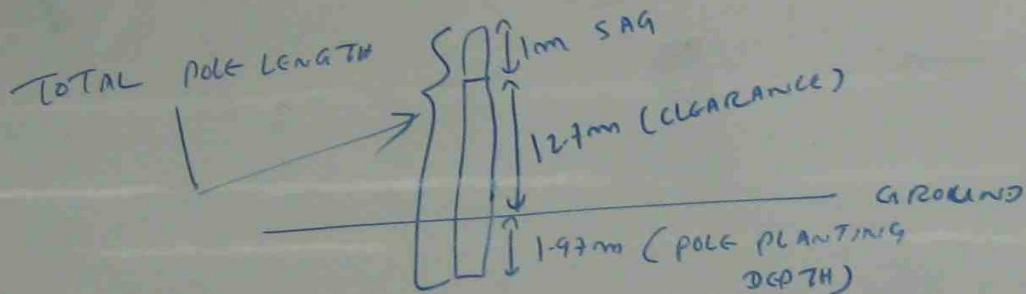
$$\text{RULING AVERAGE SAG} = 1.0 \text{ m}$$

- NOMINATE THE FACTORS WHICH DETERMINE THE CURRENT RATING OF CABLE.

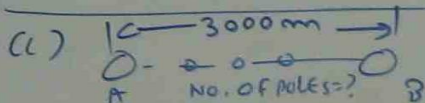


WEN  
ND  
ON

(b) Pole planting depth =  $0.6 + 0.1 (\text{maximum sag} + \text{ground clearance})$   
 $= 0.6 + 0.1 \times (1 + 12.7)$   
 $= 0.6 + 0.1 \times 13.7 = 1.97 \text{ m}$



TOTAL POLE LENGTH =  $1.97 + 12.7 + 1 = 15.67 \text{ m}$



$$\text{SAG} = \frac{W l^2}{8 T} \quad l = \text{pole span}$$

$$\text{No. of poles} = \frac{\text{LENGTH OF THE LINE}}{\text{pole span}} + 1$$

$\text{SAG} = 1 \text{ m}$

$F = mg = 43 \times 9.81$

$T = 64 \text{ N} \left\{ \begin{aligned} W_c &= F/m = \frac{43 \times 9.81}{100} = 4.22 \text{ N/m} \\ \downarrow W_c \end{aligned} \right.$

$\text{WIND FORCE } (W_w) = \text{WIND} \times \text{DIAMETER} \times \text{PRESSURE}$

$$= 750 \times \frac{16}{1000} \times 1$$
  

$$= 12 \text{ N/m}$$

$$W_T = \sqrt{W_c^2 + W_w^2} = \sqrt{4.22^2 + 12^2} = 12.72 \text{ N/m}$$

$$l = \sqrt{\frac{\text{SAG} \times 8 T}{W_T}} = \sqrt{\frac{1 \times 8 \times 6000}{12.72}}$$
  

$$= 61 \text{ m}$$

$$\text{NO. OF POLE} = \frac{3000}{61} + 1$$

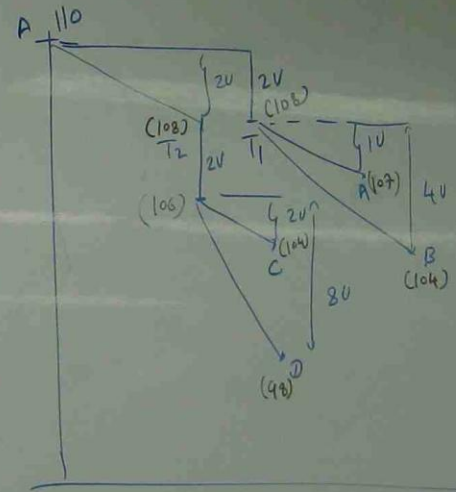
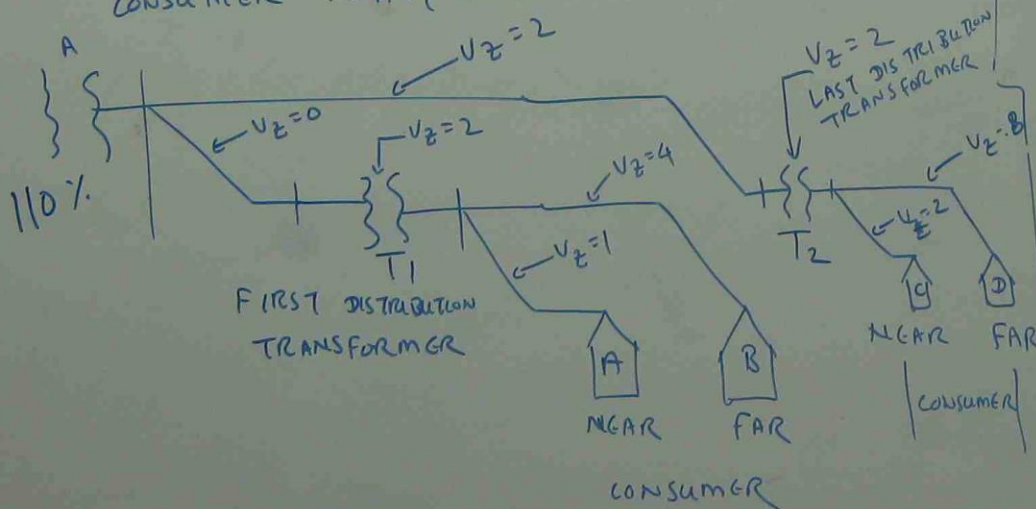
$$\approx 50 \text{ POLES}$$

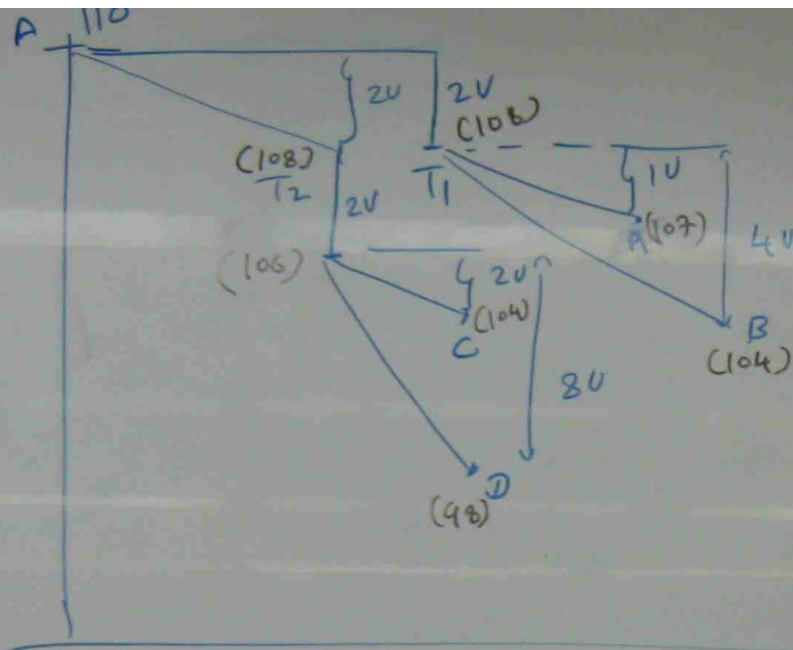
(d) CURRENT RATING OF CABLE

- THERMAL CAPACITY
- VOLTAGE DROP
- POWER LOSS
- AMBIENT TEMPERATURE

Pb

FOR THE SIMPLIFIED LINE DIAGRAM BELOW, PLOT THE VOLTAGE PROFILE FOR HEAVY LOAD PERIOD. THE VOLTAGE AT POINT A IS 110% NOMINAL. THE  $V_Z$  VALUE INDICATED ON THE DIAGRAM. SHOW THE PERCENT IMPEDANCE VOLTAGE DROP PER UNIT OF CONSUMER HEAVY CURRENT.





### TARI FFS

Ph CALCULATE THE QUARTER ACCOUNT FOR CONSUMER WHO USES 1000 KWH FOR LIGHTING & POWER AND 1000 KWH FOR STORAGE WATER HEATING.

### RATE

LIGHTING { up to 200 kwh/quarter = 12.08 c/kwh  
204 → 800 kwh/quarter = 8.74 c/kwh  
STORAGE WATER HEATING = 3.91 c/kwh

LIGHTING + POWER USAGE					COST
FIRST 200 kWh	=	12.08 c/kWh	x	200	= 24.16 \$
(1000-200) = 800 kWh	=	8.74 c/kWh	x	800	= 69.92 \$

STORAGE WATER HEATING

$$1000 \text{ kWh} \times 3.91 = 39.10$$

$$\text{TOTAL} = 133.18 \$$$

### GUIDE TO PRINCIPAL TARIFFS

DOMESTIC TARIFF

FIRST 200 kWh | QUARTER = 12.08 c/kWh

REMAINDER = 8.74 c/kWh

PENSIONER REBATE = \$16.90 | QUARTER

### MEDICAL REBATE

50% for OXYGEN CONCENTRATOR,  
HOME DIALYSIS MACHINE  
IRON LUNG

### GENERAL SUPPLY TARIFF

$$\text{FIRST 200 kWh} = 22.27 \text{ c/kWh}$$

$$\text{REMAINDER} = 14.76 \text{ c/kWh}$$

### GENERAL SUPPLY TIME OF USE TARIFF

$$\begin{array}{l} \text{ENERGY PRICE} \quad 7 \text{ AM} \rightarrow 10 \text{ PM} \\ \text{WORKING WEEKDAYS} \end{array} = 19.77 \text{ c/kWh}$$

$$\text{OTHER TIME} = 8.70 \text{ c/kWh}$$

### INSTITUTION TARIFF

$$\text{FIRST 200 kWh} \mid \text{STR} = 19.7 \text{ c/kWh}$$

$$\text{REMAINDER} = 11.2 \text{ c/kWh}$$

