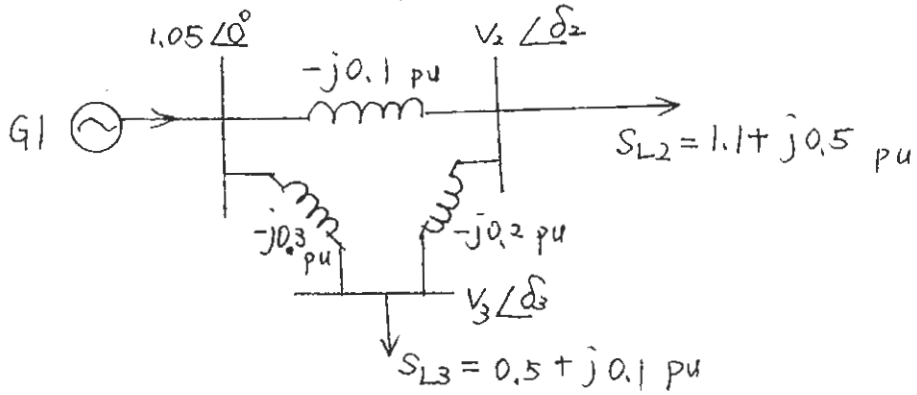
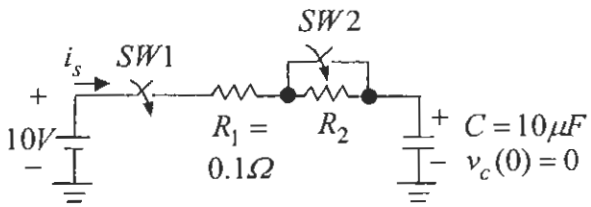
1. (a) What assumptions are made in the power flow analysis ? (b) The parameters of a power system are shown below. Find the corresponding bus admittance matrix, namely Y-bus; (c) Derive the corresponding power flow equations; (d) Find the real power generation of G1. (20%)

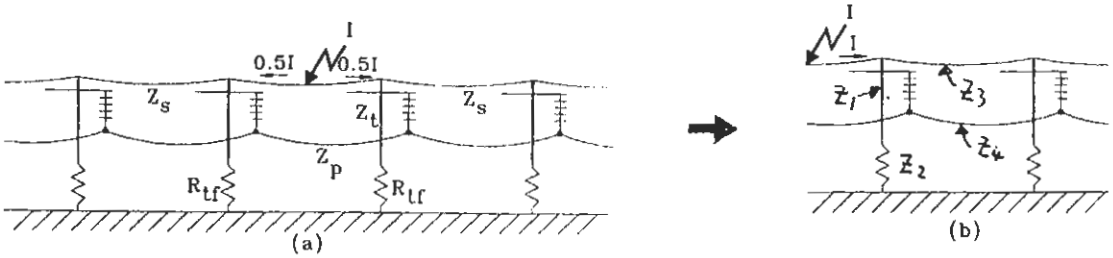


2. Assume the series impedance per unit length , z , and the shunt admittance per unit length , y , of a uniform two- wire transmission line are known. (a) Derive the transmission line differential equations which govern the transient behavior of the line.(b) What is the characteristic impedance of the line? (c) Explain briefly how to derive an exact pai-model for long transmission line. (10%)

3. (1) Find the inrush current of i_s when SW1 is turned on (SW2 in off).
(2) Find R_2 to reduce the inrush current to be 10A, and describe how to operate SW1 and SW2. (10%)



4. (1) As shown in Fig (a), a lightning stroke is occurred to the shield wire at midspan for a shielded line. The equivalent circuit of Fig. (a) is drawn in Fig. (b), give the impedances of Z_1, Z_2, Z_3 and Z_4.
(2) Draw a standard lightning impulse voltage waveform, labeling the key parameters on it. (10%)



5、The Power System shown below comprises of the following three system elecments： (20%)

Generator	30MVA	18kV
Transformer	30MVA	18kV/69kV
Transmission line	30MVA	69kV

Their individual sequance reactances are (by ignoring resistnace)：

	X_1	X_2	X_0
Element A	0.10	0.10	0.30
Element B	0.30	0.20	0.05
Element C	0.12	0.12	0.12

（a） Match generator, transformer and line individually with elements A, B and C; or specify which is A, B and C individually.

（b） Assume a 69kV industrial power system is under planning for paralelling with bus D.

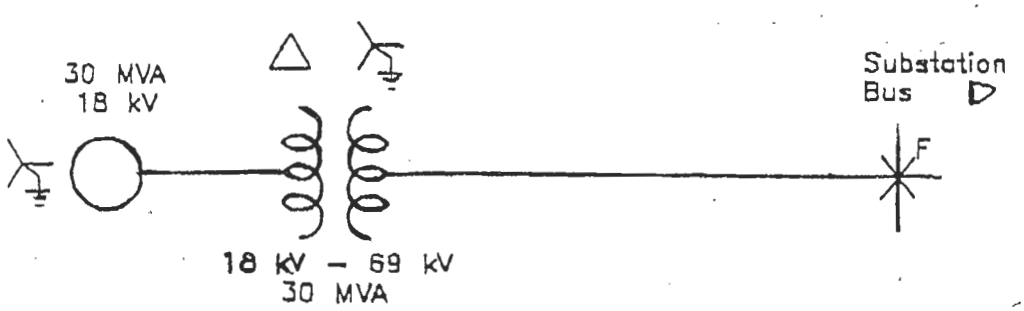
(b-1) Estimate the equivalent system reactance (Xs) at bus D in Ω.

(b-2) For what prupose do you estimate Xs?

（c） Assume the phase-A-to-ground fault occurs at bus D：

（c-1） Draw the sequence network for the faulted system.

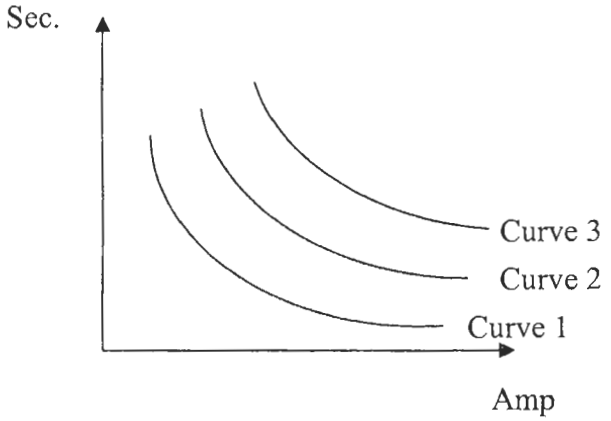
（c-2） Let V1,V2 and V0 denote the sequence voltages at the fault location. Give the order of V1, V2, and V0 from high to low (e.g., $V_1 > V_2 > V_0$, $V_0 > V_1 > V_2$ or others).



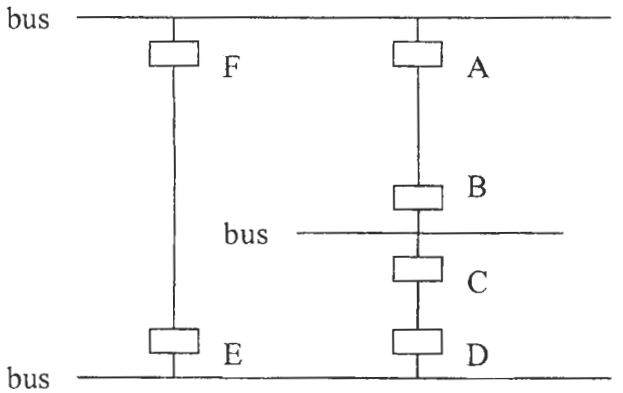
6、The tap setting and time dial setting of three overcurrent (OC) relays are as follows: (10%)

	Tap	TDS
Relay 1	1.0A	3.0
Relay 2	0.5A	2.5
Relay 3	0.5A	3.0

（a） Assume these three OC relays have been well coordinated as shown below. Match the three relays individually with these three coordination curves （or specify which relay is for curve 1, 2 and 3 individually?）.



（b） Further assume these three relays are directional OC relays. Where should they be sited within the transmission network? Answer by selecting correct combination (or combinations) of relays' sites.



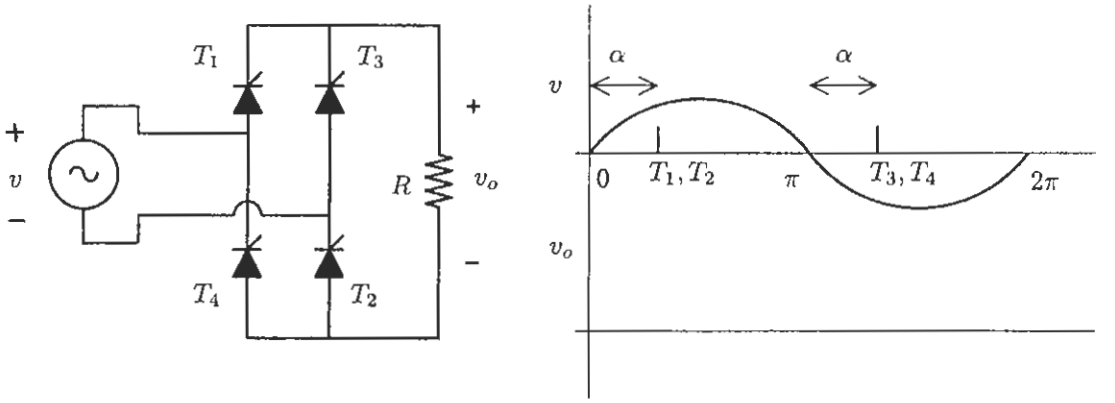
	Curve 1	Curve 2	Curve 3
Combination 1	C	A	E
Combination 2	D	F	A
Combination 3	F	C	A
Combination 4	A	D	F

7. The circuit of a single-phase thyristor rectifier bridge and its operation waveforms are as given. The AC input voltage $v = V\sin(\omega t)$. Assuming a resistor R is applied as the load. The thyristors are triggered with a delay angle of α. (10%)

(a) Sketch the output voltage v_o.

(b) Calculate the average value of v_o.

(c) Calculate the average power consumption of R.



8. The waveform of the current i is as given. Please calculate

(a) The fundamental component of i.

(b) The total harmonic distortion (THD) factor of i. (10%)