1、The parameters for the circuit shown in Fig 1 are Ra =100kΩ，R_1 = 500 kΩ，C_1 = 0.1 μF，Rb = 25kΩ，R_2 = 100kΩ，and C_2 = 1 μF. The power supply voltage for each operational amplifier is ±6V，The signal voltage(v_g) for the cascaded integrating amplifiers jumps from 0 to 250 mV at t = 0. No energy is stored in the feedback capacitors at the instant the signal is applied.

(a) Find the numerical expression of the differential equation for v_0 (5%)

(b) Find $v_0(t)$ for t≧0 (4%)

(c) Find the numerical expression of the differential equation for v_{01} (4%)

(d) Find $v_{01}(t)$ for t≧0 (4%)

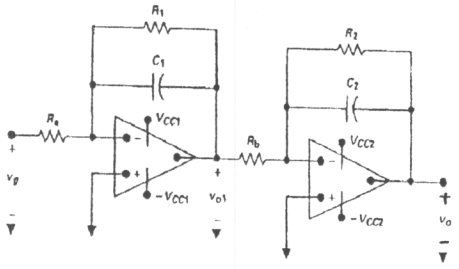


Fig.1 Cascaded integrating amplifiers with feedback resistors.

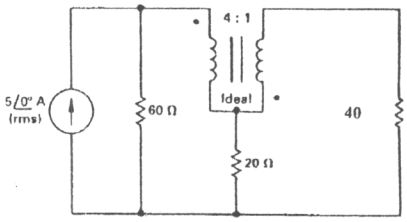


Fig.2

2、A balanced three-phase load requires 480kW at a lagging power factor of 0.8 .The load is fed from a line having an impedance of 0.005 + j 0.025 Ω/ϕ . The line voltage at the terminals of the load is 600V.

(a) Construct a single-phase equivalent circuit of the system (5%)

(b) Calculate the magnitude of the line current (4%)

(c) Calculate the magnitude of the line voltage at the sending end of the line (4%)

(d) Calculate the power factor at the sending end of the line (3%)

3、(a) Find the average power delivered by the sinusoidal current source in the circuit shown in Fig.2 (5%)

(b) Find the average power delivered to the 20Ω resistor (3%)

4、The voltage source v_g drives the circuit shown in Fig.3. The response signal is the voltage across the capacitor, v_0.

(a) Calculate the numerical expression for the transfer function (5%)

(b) Calculate the numerical values for the poles and zeros of the transfer function (4%)

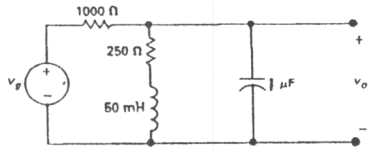
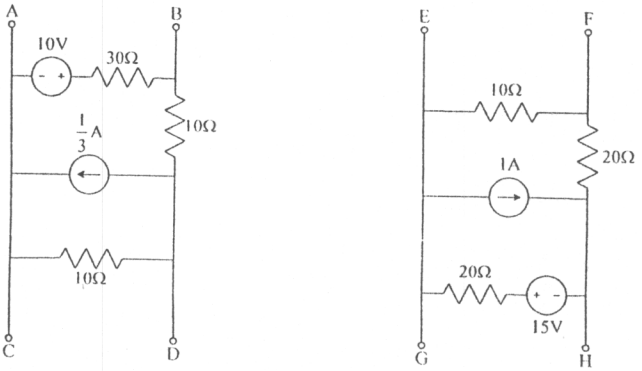


Fig. 3

5. With the combination of two circuits shown in Fig. 4(a) and Fig. 4(b), where A is connected with E, and B is connected with F, please find the current exchanged by these two circuits. (15%)



(a) (b)

Fig. 4

6. The circuit of Fig. 5 is assumed in steady state at $t=0^-$, please find i(t) for $t\geq 0$. (15%)

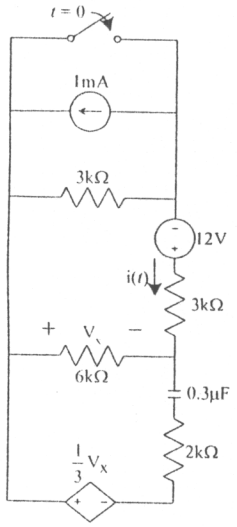


Fig. 5

7. In Fig. 6, with the employment of a voltmeter to measure the voltage V_1, it reads 5.5V.

(a) Please calculate the resistance of this voltmeter. (10%)

(b) What is the percentage of error in the voltage measurement? (10%)

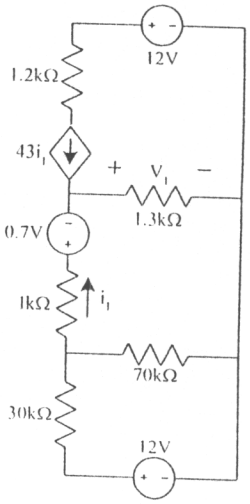


Fig. 6