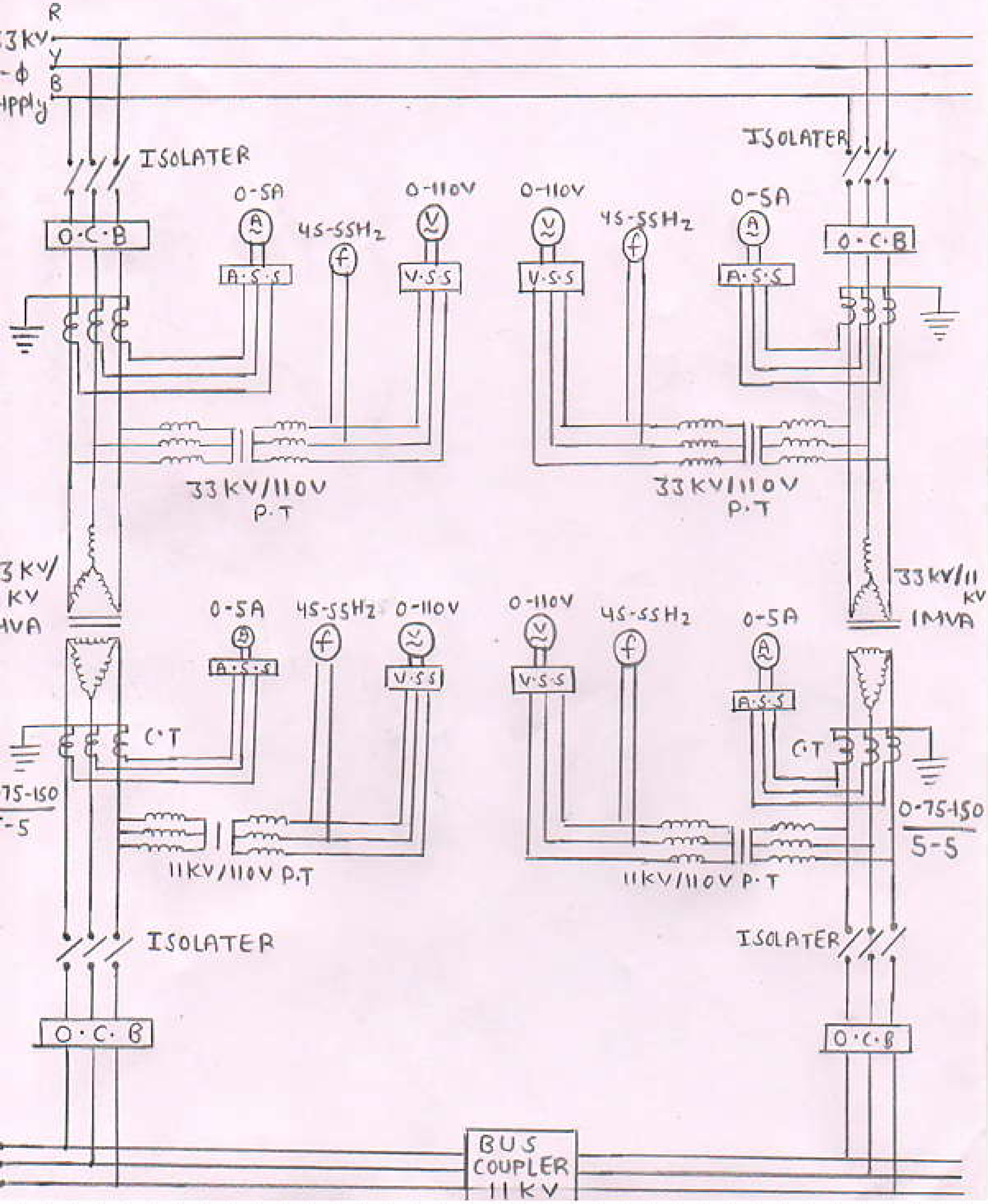
CLASS-TEST-III

MM=15 (1)

EE-304 Electrical Design and Drawing TIME = 1Hr

-: Solution :-

Q.1 Draw panel wiring diagram for parallel operation of two given transformer. (10)



Symbole

Ammeter = A

Voltmeter = V

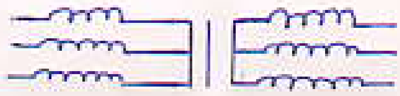
Frequency meter = f

Isolater = °/°

Ampere selector Switch = $\boxed{A \cdot S \cdot S}$

Voltage Selector Switch = $\boxed{V \cdot S \cdot S}$

Current Transformer = 

Potential Transformer = 

Q.2 Derive output equation of 3-ϕ ~~Transformer~~ Induction Motor, interms of motor dimensions i.e ($KVA = C_0 D^2 L n_s$) (3)

Solutions - Output equation - (5)

Assume following terms

E_{ph} = Induced emf perphase

I_{ph} = Phase current

T_{ph} = No. of turns perphase

ϕ = Flux per pole in air gap

P = No. of poles

K_w = winding factor

B_{av} = Average value of flux density in the air gap

ac = Amp. conductor per-meter of the armature peri-phery

D = Armature diameter or starter bore

L = starter core length

N_s = Synchronous speed

$\cos\phi$ = Power factor

η = full load efficiency

τ = pole pitch = (πD)

The KVA rating of 3-ϕ I/M is:-

$$KVA = 3 \times E_{ph} \times I_{ph} \times 10^{-3}$$

$$= 3 \times 4.44 f \phi T_{ph} \cdot I_{ph} \cdot K_w \times 10^{-3} \quad \text{---} (1)$$

$$\{\because E_{ph} = 4.44 f \phi T_{ph} \cdot K_w\}$$

The synchronous speed

$$N_s = \frac{120f}{P} \ (rpm)$$

$$N_s = \frac{120f}{P \times 60} \ (rpm)$$

$$N_s = \frac{2f}{P}$$

$$\Rightarrow f = \frac{N_S \times P}{2} \quad \text{----} (2)$$

∵ We know that

Specific Magnetic loading

$$B_{av} = \frac{\phi P}{\pi D L}$$

$$\phi = \frac{B_{av} \cdot \pi D L}{P} \quad \text{----} (3)$$

Again, we know that

Specific Electric loading

$$ac = \frac{3 \times 2 \times T_{ph} \cdot I_{ph}}{\pi D}$$

$$\Rightarrow T_{ph} \cdot I_{ph} = \frac{ac \cdot \pi D}{3 \times 2} \quad \text{----} (4)$$

Put all the value of f, ϕ, $T_{ph} \cdot I_{ph}$ in eq.

$$KVA = 3 \times 4.44 \times \frac{N_S \times P}{2} \times \frac{B_{av} \pi D L}{P} \times \frac{ac \cdot \pi D}{3 \times 2} \times K_W \times 10^{-3}$$

$$KVA = (1.11 \pi^2 K_W B_{av} \cdot ac \times 10^{-3}) \times D^2 L \cdot N_S$$

$$\boxed{KVA = C_0 D^2 L N_S}$$