## module 3

end polar forms of the rector

 $\alpha = \sqrt{8^2 + 6^2} = 10^{10.03} = 31 + 40.23 = 3$   $\phi = \tan^{-1} \frac{6}{800} = 38.860 = 3200 = 10$ 

eseponential = 10 es 36.86 to seponential = 10 e j36.86

polar - 10236.86

2. A sinuspidal voltage of V = 230 L15

Of freq. 50 HZ is applied to series

RL circuit consisting of R = 5 s. and

NL = 0.1H. colculate i) oms value of

current and its phase angle. ii)

power factor iii) avg. power iv) reactive

power and v) apparent power drawn

by the cle.

Z= JR24x12 - J5x+ p12 = 5.

n 2 = 7 = 2804/5 +

XL = WL = 2 TIFL

= 2xTx50x0.1 = 31.41 n

Z=(5+j31.41)~

ENDOOM

 $I = \frac{V}{Z} = \frac{230 \ \text{Z}15}{5 + \text{J} 31.41} = 7.23 \ \text{Z} - 6$ 

0 = 65.95 + 15 = 80.95°

p.f = cos 0 = cos 80,95

Enel + 3 2 18 200) 0 = 0.157 lag?

ang. power, p= VI, cos potentiagos = 261.56 W 201 - 20100

Reactive power, a = VI sing

EDIESS 0= 230 x 7.23 x Sip. 80.95

bae = 1642.19 VARO 311000 19

AL = 0-17 - COLCUL<del>S LE 11 =</del> 1701 VOLIUS OF Apparent power, s - VI e

= 230 x 7.23 = 1662.9 OVANOS

= 1.662 KVA

3. A resistor of 50 st, on inductor of 0.14 and a copacitor of 40MF are connected in series and the combination is connected access 220 V, 50 HZ supply. calculate i) the circuit impedance

ii) resulting current iii) p.f iv) phase angle and v) power consumed by the months of he of month making DARA BLOOD ENTERNA COM BOR ONH SON XU=WL W BOW IN SON SON SON SON SON 220V = 220V = 27×50×0.1 220V 21/1 (1 BOTE 31.41 of Walnut 8 50000  $\frac{1}{2\pi f c} = \frac{1}{2\pi x 50 \times 40 \times 10^6}$   $= 79.57 \Lambda$ - date who is Z = R+j(xL-xc) HI= 50+j(31.41-79.57) = 50 - 148.16 = 69.42 L = 43.92 $I = \frac{V}{Z} = \frac{220.92}{69.42243.92} = \frac{3.169443.92}{2000}$ p.f = cos 43.92 = 0.720 leading phase angle = 43.92 P=VI CDS4 = 220 x 3.169 x 0.72 = 501.96 W = 01 16 BX E31.4142 14 67773 AE - 74 1567 SA - 27

4 coil A having resistance of 2012 and inductance of 0.2 H is connected in series with another coil B having resistance of 15 s. and inductance of 0.1 H. The two coils in series are fed from 220v, 50 Hz, single phase power supply. Determine i) the voltage occupss each coil iii) power dissipated in each coil iii) pf

 $XLA = 2 \pi f LA = 2 \pi \times 50 \times 0.2$   $= 62.83 \pi$ 

ZA = 20+ 162.83 = 65.93272.34

XB = 2xfLB = 27 x x50 x 0.1 = 31.41.02

ZB = 15 + j31.41 = 34.81 264.47

= 65.93 272.34 × 34.81 264.47 Z = ZA +ZB = 100.53 269.62 N and soon and 4 I = 0 V 0 = 0 220 5000 0 = 2 18 6-69.62 20053269.62 VA = IZA = 2.18 x 65.93 472.34 = 143.72 272/3/4 2.72 VB = IZB = 2.18 2-69-62 x 34-81 2 64-47 = 75.57 4-6.81 power absorbed in willA = I2RA = 2.182 x 20 AA = 95.048 W power orbsorbed in wil B  $= I^2 RB = 2.18^2 \times 15^-$ = 71.286 W P.f = Cos 69.62 = 0.34 leading

6. A resistance of 102, an inductance of 100HF are connected in series occuss 230V, 50Hz single phase supply calculate i) the impedance of the cit ii) current through the old iii) voltage across R, L and C, iv) power consumed by the ckt. w) p.f og the clet LOOME WILL CONT XL = 2ATL WATER CVENCY = 21x50x0.3 =94.2452 230V, 50 HZ.  $x_{c} = \frac{1}{2\pi f c} = \frac{1}{2\pi x 50 \times 100 \times 10^{6}}$ = 31.832 Z = /R2 + (XL - XC)2 + Z = R+j(xL-xc) = 10+j(94.24-31.83) = 10+j62.4 = 63.2 < 80.89  $T = V = 230 \times 0$ Z 63.2280.89 = 3.632-8089 p.f = cos 80.89 = 0.158 lagging

 $V_R = IR = 3.639 \ \angle -80.89 \ \times 10$ = 36.39 \alpha -80.89 VI = 1 XL = 3.639 2-80.89 x 94.24 290 = 342.95 ×9.11-403 ×052 · HO SAL BY TOUCHONDANT THE CHANGE Vc = 1xc = 3.639 < - 80.89 × 31.83 < -90 = 115.856 L-170.89 command the the chiral by by constru P = VI COS OP = 230x 3.639 x 0.158 3V = 132.24 W JAS = JX E BA XSO XE 3 =94.24 12 27-16 STANDENION STOP = 31.832-8+1(xt-xt)= no+1(44.24-31.83 J. 080 L

1. A balanced 3 phase coad consist og 3 wils each og resistance 62 and inductive reactance of 8 s. petermine the une current and power absorbed when the coils are i) star connected ii) delta connected across 4000, 3 phase supply insuitable of one H and competited at Zphielic +jister bone we to terry on Nr 2 200 N ZH 03, N 314 stong & E can what for but star and star trace stary a mails some  $Vph = \frac{VL}{\sqrt{3}} = \frac{400}{\sqrt{3}} = 230.9V$  $Iph = \frac{Vph}{Zph} = \frac{230.9}{6+j8} = 23.09 < -53.$ IL = Iph. P = V3 VL IL COS 4 Or 3 Vph Iph Cos 4 = 3x 230.9 x 23.09 x cos 53.13 = 9596.68 W = 959 KW perta Vph = VL = 400V Iph = Vph = 239.9 400 IL = V3 Jph = V3 ×40 2-53.13 = 69.28 253.13 A p = 3 wh Iph cos & = 3 × 400 × 40 × cus 63.13

base the 28.8 kW substitute base

a. Three inductive coirs, each with or resistance of 22 st and an inductance of 0.05 H are connected in first star and then delta, to a 3 phase 415 v, 50 Hz supply.

concludate for both star and delta connections, i) phase current and time current and ii) total power absorbed.

Z=22+1010 8(+) dq=

XL = 27 FL = 27 x50 × 000 B TEV = 9

DE1+6

NOCT = TA = GUA

Z = 22+j 15.7 2 W \$3.3000 -

star

EL E VL = 415 V

Vph = \frac{\psi\_L}{\sqrt{3}} = \frac{415}{\sqrt{3}} = \frac{239.6 \chi^3}{\sqrt{3}}

Iph = Vph = 239.6 = 8.872-35.52 IL = Iph = 8.87 2-35.52 D = 3 vph Iph cos φ = 3 x 239.6 x 8.87 cus 39 Se + 5 - 183 kw Delta du ster 18.01 det VL = Vph = 415 V 1+ 22819 = Iph = Vph = 415 = 15.37 <-35.53 Zph 22+j15.7 IL = V3 Iph = V3 x 16.37 L-35.53 = 26.62 L-36.63 0° = 1X P = 3 Vph Iph Cusque To = 3 × 415 × 28.15.37 × cos 35.53 e belocked e SLOVE SE 15.5 KW 2 FEW SLOVE 3. Three similar coils connected in star draw a total power of 15 km at a power factor of 0.2 lagging from or 3 phase 4000, 50 HZ power supply, calculate the resistance and indudance of each coil.

p = 3 Vph Iph cos q 1.5 kW = 3x 400 x Jph . 05 x 0.2

3 Jph = 10.82 A 478.46 Vph = 230.94  $Zph = \frac{Vph}{Jph} = \frac{230.94}{10.82} = \frac{21.32}{10.82} = \frac{78.44}{18.44}$ 

= 21.32 C+78.46

18.37 A: 55.53 - 4.26 - J. 20.88

R = 4-26 sz

(40+ 43 3ph = 15 37

XL = 20.88 38-15335 L = XL = 20.88 = 0.066 H. 271 27 x 50000 dallagre

4. A bolanced delta connected 3 phase Load is fed from a 3 phase 400 V, 50 HZ power supply. The line current is 20 A and the total power obsorbed by the word is 10 RW. conculate i) the impedance in each branch ii) the pt and iii) total power consumed in the same impedances are star connected-

$$V_{L} = V_{ph} = 400V$$

$$I_{L} = 20A \cdot ,$$

$$p = 10kW$$

$$10kW = \sqrt{3} V_{L} I_{L} \cos \phi$$

$$= \sqrt{3} \times 400 \times 20 \cos \phi$$

$$\cos \phi = \frac{0.72}{T_{ph}} = \frac{400}{11.64} = \frac{43.94}{24.94}$$

$$= \frac{24.9k}{34.66} = \frac{43.94}{34.664}$$

$$I_{p} = \frac{V_{p}}{V_{p}} = \frac{230.94}{34.664} = \frac{230.94}{34.664}$$

$$P = 3 \times 230.94 \times 6.66 \times \cos 43.94$$

$$= \frac{33.8W}{34.86}$$

A balanced star connected coad of impedance 6+182 is connected in a sphase 230 V, 50 Hz. Find line current and power absorbed by each place.

Z=6+j8 = 10 < 53.13

NL = 230 V , f = 50 HZ

Vp = VL = 230 = 132.79 V 9=

 $I_{p} = \frac{V_{p}}{Z} = \frac{132.79}{10.453.13} = 13.27 \ \angle -53.13$ 

P= NJ VC IC COS P

Ip = IL = 13.27 A

 $p = V_p T_p \cos \phi = 0.00 \times 10^{-2} = 132.79 \times 13.27 \times 0.05 \times 53.13$   $= 1057.27 \omega$ 

per phase impedance of (30+j50)...

per phase impedance of (30+j50)...

If the boad is connected access

400 V, 3 phase supply find i) phase

when it is

connected in a) star b) della.

2p = 30+j50 = 58.31 259.0360 00 A 3 phote 230 V, South End Ungerson and power appearant by oak - while Pp = 400 = 230.9 V 1) Ip = Vp = 230.9 - NOES . W. ZP 58.31 459.036 N = 9V = 3.96 459.036 Ip = Vp = 132-7 IL = Ip = 3.96 < -59.03 Ip= Ic= 13.27 A P = V3 VL IL COS \$ = V3 x 400 x 3.96 x cos 59.03 = 0 = 1411.81W = 12.81 = 1141= = 1057.27w Derta e paramed made prooped a IP = 400 = 400 sealer 130 = 6.859 2-59.036. NOOA warent in was our P = 3 Vp Ip cospo bad a boilgaus

= 3 x 6.859 x 400 x CDS 59.036 = 4234.74 W

IL = V3 Ip = 11.86 K-59.031

7. The Load to a 3 phase supply comprises of three similar coils connected in star. The line currents are 25 A and KVA and KW ilp are 20 and 11 resply. Find phase and line voltage a) the KVA7 input 3) resistance and reactance ez each coil.

IL=25A

Ip = 25 A

KMAR =  $\sqrt{kVB^2 - kW^2} = \sqrt{20^2 - 11^2} = 16.7 kVAR$ 

P=V3 VLILCOSQ

S = 3VPIP

Vp = 20x103 = 266.66 V

VL = V3 x 266.66

= 461.88V

 $p.f = \frac{kw}{kvA} = \frac{11}{20} = 0.55$  $Zp = \frac{Vp}{Zp} = \frac{266.66}{252.656.63} = \frac{10.6600}{252.656.63} = \frac{256.63}{252.656.63} = \frac{10.6600}{252.656.63}$ angmas plaque seada e a at bout 5.86+18.9 CR=Z. COSP=110-66 x 0.55 39503 00 200 \$134 LE STOPESTE ST. 2012 WIE 1018 Sacret x = 170.66 = 5.872 = 8.9200 AVX THE BUSIN THE POSE STONE POLL EVAD EMPLY 3) ADDITION OF BOOK ARDED LUANS GAS es each cont. 12:25:11 Land KKAR = 1 KV 12 - KW = 1202-112 = 167 KVAR P=V3VLILUE 4 some alpen and a No 2 2 66166 4 201409 - 29V