



CYFENW: Evans

ENW(AU) CYNTAF: Dafydd John
Llewelyn

Llyfr Atebion Arholiadau

12 Tudalen

Cyfarwyddiadau i Ymgeiswyr

1. Rhwch yr holl wybodaeth y gofynnir amdani yn y blychau isod.
2. Rhwch eich enw yn y lle a ddarparwyd ar y dde, plygwch ef a'i selio i lawr (gan ddefnyddio'r label a ddarparwyd) i guddio'ch enw.
3. Rhaid i'r atebion fod mewn llawysgrifen ddarllenadwy. Gall yr Arholwyr naill ai anwybyddu sgript annarllenadwy, neu drefnu iddi gael ei theipio a chael yr ymgeisydd i dalu.
4. Ysgrifennwch eich atebion mewn inc.
5. Dechreuwch bob ateb ar dudalen newydd. Gwnewch unrhyw fras nodiadau yn y llyfr atebion a thynnu llinell drwyddynt.
6. Ni ddylid rhwygo unrhyw ran o'r llyfr hwn; rhaid ei gyflwyno yn gyfan.
7. Os defnyddir mwy nag un llyfr, rhwymwch hwy gyda'i gilydd gan ddefnyddio'r tagiau sydd ar gael oddi wrth y gwyliwr/gwylwyr.
8. Rhaid dychwelyd pob llyfr. Ni chaniateir mynd â llyfrau atebion, wedi eu defnyddio neu heb eu defnyddio, allan o'r lleoliad arholi o dan unrhyw amgylchiadau.

1	Rhif Myfyriwr	EVA18843717
2	Teitl y Papur Arholiad	Electrical Power
3	Cod y Modwl	GOEES000
4	Dyddiad ac Amser yr Archoliad	17/05/22 2:00pm
5	Lleoliad yr Arholiad	W 2
6	Rhif Sedd	5
7	Nifer y Llyfrau Atebion a gyflwynwyd	

Rhestrwch rifau'r cwestiynau a ymgeisiwyd gennych	At Ddibenion y Swyddfa
Q1	15
Q2	25
Q3	15
Q4	25
Cyfanswm	80/100

1 a) $V_{an} = 220 \angle 0^\circ \checkmark$
 $Z = 2 + 20 - j10 \Omega \checkmark$
 $= 22 - j10 \Omega \checkmark$

Q1a
15/15

$$I_a = \frac{V}{Z} = \frac{220 \angle 0^\circ}{24.17 \angle -24.44^\circ} = 9.1 \angle 24.44^\circ A$$

$$= 8.28 + j3.77$$

$$I_b = \frac{V}{Z} = \frac{220 \angle -120^\circ}{30 + 2} = 6.875 \angle -120^\circ A$$

$$= \frac{220 \angle -120^\circ}{32} = -3.44 - j5.95$$

$$I_c = \frac{V}{Z} = \frac{220 \angle 120^\circ}{2 + 15 + j5}$$

$$= \frac{220 \angle 120^\circ}{17 + j5} = \frac{220 \angle 120^\circ}{17.72 \angle 16.39^\circ}$$

$$= 12.42 \angle 103.61^\circ A$$

$$= -2.92 + j12.07$$

$$I_n = -(8.28 + j3.77) + (-3.44 - j5.95) + (-2.92 + j12.07)$$

$$= -(1.92 + j9.89)$$

$$= -1.92 - j9.89 A$$

$$= 10.07 \angle -100.99^\circ A$$

b) $V_{an} = 220 \angle 0^\circ \checkmark$
 $V_{bn} = 220 \angle -120^\circ \checkmark$
 $V_{cn} = 220 \angle 120^\circ \checkmark$

Q1b
0/10

$$V_{ab} = \sqrt{3} V_{an} \angle 30^\circ$$

$$= \sqrt{3} 220 \angle 30^\circ$$

$$= 381.05 \angle 30^\circ \checkmark$$

$$V_{bc} = 381.05 \angle -90^\circ \checkmark$$

$$V_{ac} = 381.05 \angle 150^\circ \checkmark$$

$$Z = (6 - j2) + (12 + j8)$$

$$= 18 - j6 = 18.97 \angle -18.43^\circ \Omega$$

$$I_a = \frac{V_{ab}}{Z} = \frac{381.05 \angle 30^\circ}{18.97 \angle -18.43^\circ} = 20.09 \angle 48.43^\circ \text{ A}$$

$$I_b = \frac{V_{bc}}{Z} = \frac{381.05 \angle -90^\circ}{18.97 \angle -18.43^\circ} = 20.09 \angle -71.57^\circ \text{ A}$$

$$I_c = \frac{V_{ac}}{Z} = \frac{381.05 \angle 150^\circ}{18.97 \angle -18.43^\circ} = 20.09 \angle 168.43^\circ \text{ A}$$

$$2 \quad i) \quad Z_1 = 20 \, \Omega$$

$$Z_{//} = \frac{(-j10) + (j30 + 60)}{-j10 + j30 + 60} = \frac{300 - j600}{j20 + 60}$$

$$= \frac{300 - j600}{60 + j20} = \frac{670.82 \angle -63.43^\circ}{63.25 \angle 18.43^\circ}$$

$$= 10.61 \angle -81.86^\circ$$

$$= 1.5 - j10.5 \, \Omega$$

$$Z_T = 20 + 1.5 - j10.5$$

$$= 21.5 - j10.5$$

$$= 23.93 \angle -26.03^\circ \, \Omega$$

$$ii) \quad I = \frac{V}{Z} = \frac{230 \angle 0^\circ}{23.93 \angle -26.03^\circ} = 9.61 \angle 26.03^\circ \text{ A}$$

$$I^* = 9.61 \angle -26.03^\circ \text{ A}$$

$$iii) \quad \text{Complex } p(\bar{S}) = V \times I^*$$

$$= 230 \angle 0^\circ \times 9.61 \angle -26.03^\circ$$

$$= 2210.3 \angle -26.03^\circ \text{ VA}$$

$$iv) \quad \bar{S} = 2210.3 \angle -26.03^\circ \text{ VA}$$

$$v) \quad = 2210.45 - j969.97$$

$$\bar{S} = P + jQ$$

$$P = 1986.1 \text{ W}$$

$$Q = -969.97 \text{ VAR}$$

Q2

25/25

3 a) $Z = 20 - j15 \Omega$, $V_{ab} = 330 \angle 0^\circ$

Q39

12/15

i) $V_{ab} = 330 \angle 0^\circ V$ ✓
 $V_{bc} = 330 \angle -120^\circ V$ ✓
 $V_{ac} = 330 \angle 120^\circ V$ ✓ ✓ 3_{11}

$20 - j15$
 $= 25 \angle -36.87^\circ \Omega$

ii) $I_{AB} = \frac{V_{ab}}{Z} = \frac{330 \angle 0^\circ}{25 \angle -36.87^\circ} = 13.2 \angle 36.87^\circ A$ ✓

$I_{BC} = \frac{V_{bc}}{Z} = \frac{330 \angle -120^\circ}{25 \angle -36.87^\circ} = 13.2 \angle 83.13^\circ A$ ✓ -83.13°

$I_{AC} = \frac{V_{ac}}{Z} = \frac{330 \angle 120^\circ}{25 \angle -36.87^\circ} = 13.2 \angle 156.87^\circ A$ ✓

iii) $I_a = \sqrt{3} I_{AB} \angle -30^\circ$ ✓ 119
 $= \sqrt{3} 13.2 \angle 6.87^\circ = 22.86 \angle 6.87^\circ A$ ✓

$I_b = \sqrt{3} I_{BC} \angle -30^\circ$ ✓
 $= \sqrt{3} 13.2 \angle 53.13^\circ = 22.86 \angle 53.13^\circ A$ ✓

$I_c = \sqrt{3} I_{AC} \angle -30^\circ$ ✓ $2/3$
 $= \sqrt{3} 13.2 \angle 126.87^\circ = 22.86 \angle 126.87^\circ A$ ✓

b) $Z = 4 + j3$ $208V$
 $= 5 \angle 36.87^\circ \Omega$

$I = \frac{V}{Z} = \frac{208 \angle 0^\circ}{5 \angle 36.87^\circ} = 41.6 \angle -36.87^\circ A$

$P = V \times I \cos \theta$
 $= 208 \times 41.6 \cos(-36.87)$
 $= 6922.23 W$



$$\begin{aligned}
 Q &= V \times I \times \sin \theta \\
 &= 208 \times 41.6 \times \sin(-36.87) \\
 &= -5191.69 \text{ VAR}
 \end{aligned}$$

$Q_T = ?$ ✓

~~$$\begin{aligned}
 S &= \sqrt{P^2 + Q^2} \\
 &= \sqrt{6922.23^2 + (-5191.69)^2} \\
 &= 8652 \text{ VA}
 \end{aligned}$$~~

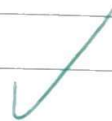
$$\begin{aligned}
 S &= V \times I \\
 &= 208 \times 41.6 \\
 &= 8652 \text{ VA}
 \end{aligned}$$

~~$$\begin{aligned}
 \text{Power factor} &= \frac{P}{S} \\
 &= \frac{6922.23}{8652} \\
 &= 0.8
 \end{aligned}$$~~

$$\begin{aligned}
 pf &= \frac{P}{S} \\
 &= \frac{6922.23}{8652} \\
 &= 0.8
 \end{aligned}$$

$S_T = ?$

✓ ✓



Q3b

3/10

4 100 kVA (S) $pf = 0.6$, $V = 220V$ 50 Hz
0.85 pf?

Q4

25/25

$$pf = 0.6$$

$$0.6 = \cos \theta$$

$$\theta = \cos^{-1} 0.6 = 53.13^\circ$$

$$P = S \cos \theta$$

$$= 100 \times 10^3 \times 0.6 = 60,000 \text{ W}$$

$$Q_1 = S \sin \theta$$

$$= 100 \times 10^3 \times \sin 53.13^\circ = 79,999.89 \text{ VAR}$$

$$pf = 0.85$$

$$0.85 = \cos \theta$$

$$\theta = \cos^{-1} 0.85 = 31.79^\circ$$

P stays the same

$$S = \frac{P}{pf} = \frac{60,000}{0.85} = 70588.24 \text{ VA}$$

$$Q_2 = S \sin \theta$$

$$= 70588.24 \times \sin 31.79^\circ = 37186.41 \text{ VAR}$$

$$Q_c = Q_1 - Q_2$$

$$= 79999.89 - 37186.41 = 42813.48 \text{ VAR}$$

$$Q_c = \frac{V^2}{X_c}$$

$$X_c = \frac{V^2}{Q_c}$$

$$= \frac{220^2}{42813.48} = 1.13$$

$$X_c = \frac{1}{2\pi f c}$$

$$\therefore c = \frac{1}{2\pi f X_c} = \frac{1}{2\pi \times 50 \times 1.13} = 2816.9 \mu\text{F}$$

