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University of Jordan
Faculty of Engineering & Technology
Electrical Engineering Department
First Semester 2014-2015

EE091212: Electric Circuits II
First Exam
29/10/2014
Time: 75 Minutes

Student Name: [redacted] **Student ID** [redacted] **Section #**

Mark the correct answer for each of the following statements.

SHOW YOUR CALCULATIONS IN THE SPACE PROVIDED

QUESTION #	ANSWER			
1.	(a)	b	c	d
2.	a	b	(c)	d
3.	a	b	(c)	d
4.	a	(b)	c	d
5.	a	b	(c)	d
6.	a	b	c	(d)
7.	(a)	b	c	d
8.	a	b	(c)	d
9.	(a)	b	c	d
10.	a	(b)	c	d
11.	a	b	(c)	d
12.	(a)	b	c	d
13.	a	(b)	c	d
14.	a	b	c	(d)
15.	a	(b)	c	d
16.	a	b	c	(d)
17.	(a)	b	c	d
18.	a	(b)	c	d
19.	a	b	(c)	d
20.	a	b	c	(d)
21.	(a)	b	c	(d)
22.	a	(b)	c	d
23.	a	b	(c)	d
24.	a	(b)	c	d
25.	(a)	b	c	d
26.	a	(b)	c	d
27.	a	b	c	(d)

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Questions 1-3

In Fig. 1, $v(t) = v_{dc}(t) + v_1(t) + v_2(t) + v_3(t)$. Answer questions 1-3.

1. the average voltage V_{dc} is _____ V.

   (a) 0.0 b. 30 c. 25 d. 54.77

2. the effective voltage V_{eff} is _____ V.

   a. 28.28 b. 70.71 (c.) 38.73 d. 54.77

3. if $v(t)$ appears across a 10-Ω resistor, the average power dissipated is _____ W.

   a. 150 b. 300 (c.) 1000 d. 80

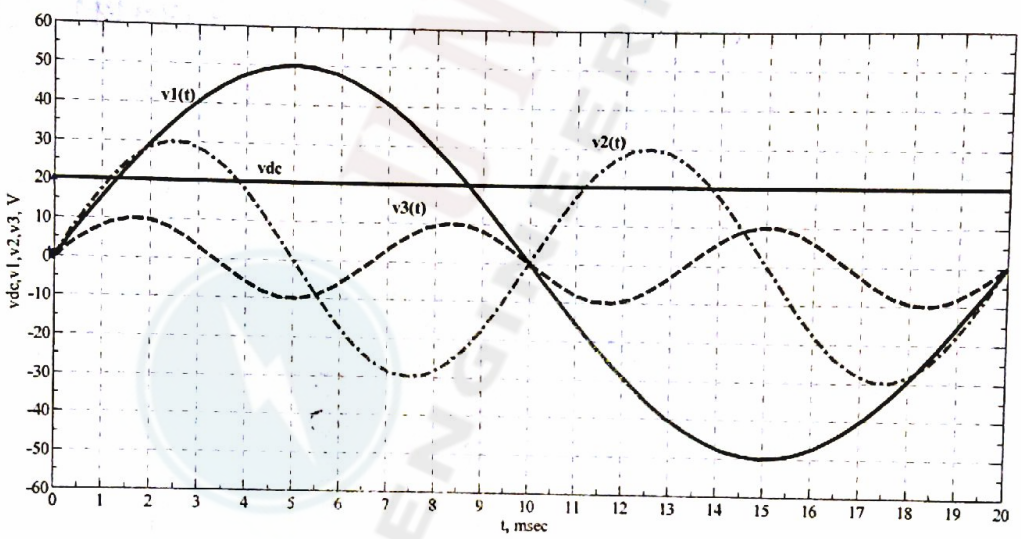


Fig.1

Questions 4-9

Figure 2 shows the voltage $v(t)$ applied to a load and its absorbed instantaneous power $p(t)$. If the load composed of resistive R and reactive X elements in series. Answer questions 4-9.

4. the voltage amplitude V_m is _____ V.

   a. 7.07 (b) 10 c. 14.14 d. 5

5. the frequency, f, of the voltage waveform is _____ Hz.

   a. 20 b. 40 (c) 50 d. 100

6. the average power P drawn by the load is _____ W.

   a. 60 (b) 40 c. 30 (d) 20

7. the current amplitude I_m is _____ A.

   (a) 4 b. 8 c. 6 d. 12

8. the phase shift θ between $v(t)$ and $i(t)$ is _____.

   a. 0° b. 30° (c) 60° d. 45°

9. The instantaneous power $p(t)$ is given by _____ A.

   (a) $20 + 40\cos(200\pi t - 60°)$ b. $40 + 40\sin(100\pi t + 30°)$
   c. $80\sin(100\pi t + 30°)$ d. $80\cos(200\pi t + 60°)$

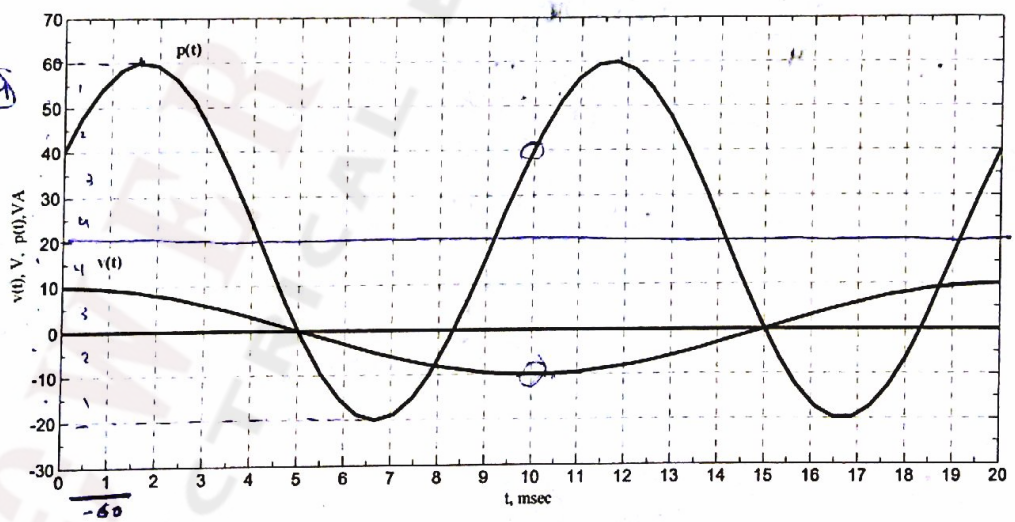


Fig. 2

Questions 10-14

For the circuit shown in Fig.3, $i_s(t) = 10\sin(100\pi t)$ A and the load impedance Z_L is adjusted to absorb the maximum average power. Answer questions 10-14.

10. the complex impedance Z_L which absorbs maximum power is _____ Ω.

    a. $2.4\angle 36.9°$ (b.) $2.4\angle -36.9°$ c. $1.78\angle -53.5°$ d. $1.78\angle +53.5°$

11. the maximum power P_{max} absorbed by the load is _____ W.

    a. 24 (b.) 30 (c.) 75 d. 37.5

12. the reactive power supplied by the source Q_s is _____ VAR.

    (a.) 28.125 b. -28.125 c. 0.0 d. -56.25

13. the power factor at the source is _____.

    a. 1.0 (b.) 0.8 lagging c. 0.8 leading d. 0.6 lagging

14. If the load impedance is replaced by a pure resistive load R_L, the value of R_L which absorbs maximum power is _____Ω.

    a. 1.92 (b.) 3 (c.) 2.4 d. 5

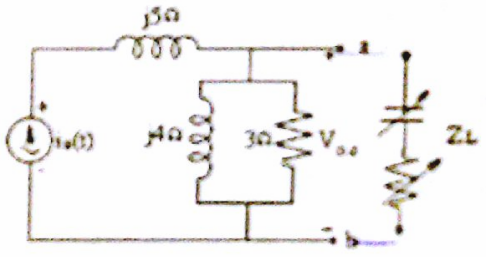


Fig.3

Questions 15-16

For the circuit shown in Fig.4, an inductive load of 12 kVA operates at $V_L = 240\angle 0°\ V_{rms}$ and 0.60 power factor lagging. If the source frequency $\omega = 314$ rad/s, answer questions 15-16.

15. the real and reactive power taken by the load P_L are _____ kVA.

a. $12 + j9.6$ b. $7.2 + j9.6$ c. $12 + j7.2$ d. $9.6 + j7.2$

16. the magnitude of the source current $|I_S|$ is _____ A.

a. 62.5 b. 20 c. 30 d. 50

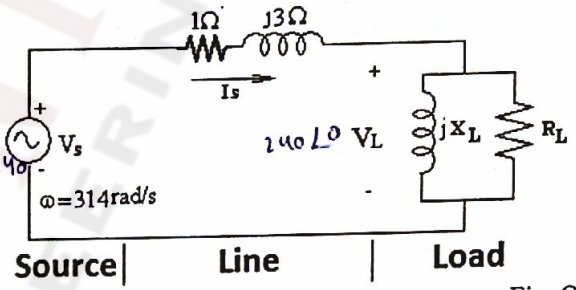


Fig. Q4

Questions 17-19 (ABET/Outcomes a)

If a capacitor is connected in parallel with load of Fig.4 to improve the overall power factor to **0.95 lagging**, answer questions 17-19.

17. the reactive power supplied by the capacitor Q_C is _____ kVAR.

a. 9.6 b. 12 c. 7.2 d. 2.4

18. the size of the capacitor C is approximately _____ μF.

a. 400 b. 530 c. 550 d. 690

19. the magnitude of the source current $|I_S|$ after adding the capacitor is _____ A.

a. 47.5 b. 30 c. 31.6 d. 50

Questions 20-22

For the circuit shown in Fig. Q5, answer questions 20-22.

20. the total real power P_{tot} and total reactive power Q_{tot} absorbed by the three loads are _____VA.

a. 1400+*j*400 b. 800-*j*400 c. 800+*j*400 d. 1400-*j*400

21. the overall load power factor *pf* is _____.

a. 0.961 leading b. 0.894 lagging c. 0.894 leading d. 0.961 lagging

22. the total real and reactive power (P_{tot}, Q_{tot}) supplied by the source are _____VA.

a. 1400+*j*440 b. 1400-*j*360 c. 800-*j*440 d. 800+*j*360

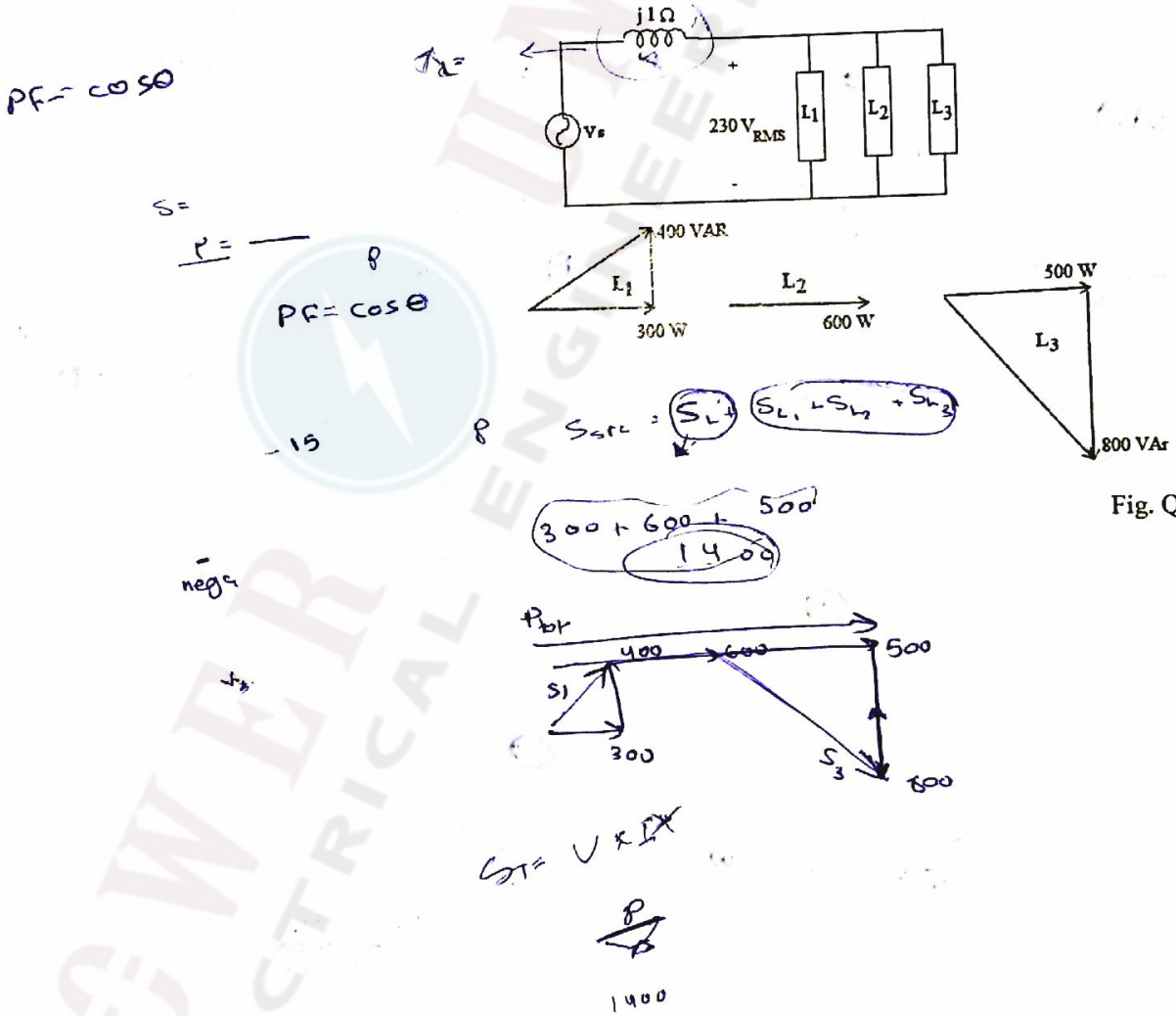
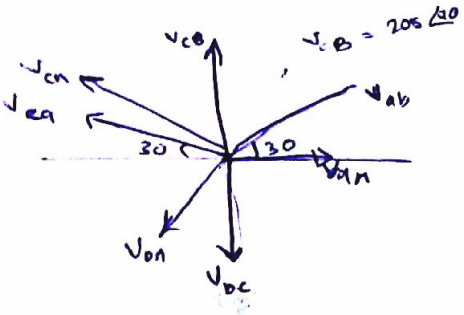


Fig. Q5

Questions 23-27

A balanced three-phase *abc* sequence Y-connected source is connected to a balanced Y-connected load through a transmission line with an impedance of $j1\ \Omega$ per phase as shown in Fig.6. The load consumes 8.64 kVA at 0.8 *pf* lagging. Given the line-to-line voltage $V_{CB} = 208\angle 90°\ V_{rms}$ at the load terminals, answer questions 23-27.



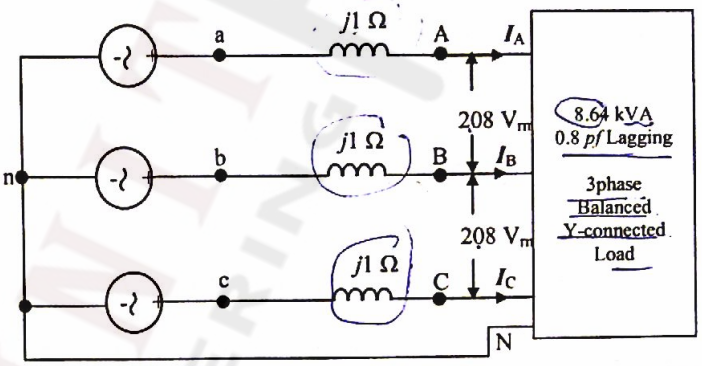
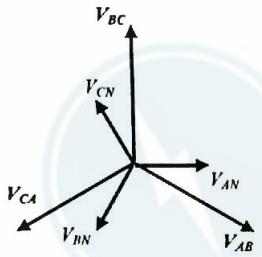


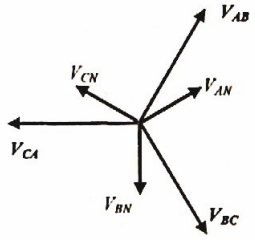
Fig. Q6

23. the phasor diagram showing the load phase and line voltages is shown in Fig. (•).

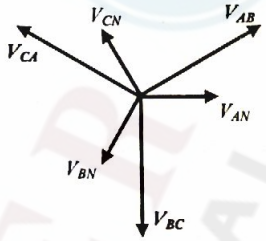
a.



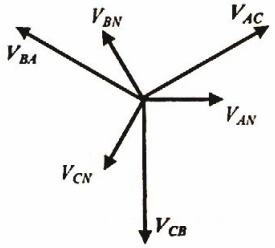
b.



c.



d.



24. The load phase voltage V_{AN} is given as_____ V_{rms}.

a. $V_{AN} = 208\angle 30°$ b. $V_{AN} = 120\angle 0°$ c. $V_{AN} = 120\angle -30°$ d. $V_{AN} = 208\angle -30°$

25. the phasor current I_A is given as_____ A_{rms}.

a. $I_A = 24\angle -36.9°$ b. $I_A = 41.6\angle -53.1°$ c. $I_A = 24\angle 36.9°$ d. $I_A = 41.6\angle 53.1°$

26. the load impedance per phase Z_Y is_____ Ω.

a. $Z_y = 5\angle -36.9°$ b. $Z_y = 5\angle 36.9°$ c. $Z_y = 8.66\angle 53.1°$ d. $Z_y = 8.66\angle 36.9°$

27. the magnitude of the source voltage $|V_{an}|$ is_____ V_{rms}.

a. $V_{an} = 232\angle 30°$ b. $V_{an} = 144\angle 0°$ c. $V_{an} = 122.4\angle 11.3°$ d. $V_{an} = 135.8\angle 8.1°$

Good Luck!