

# 國立中山大學 106 學年度碩士暨碩士專班招生考試試題

科目名稱：電路學【電機系碩士班丁組】

題號：431006

※本科目依簡章規定「可以」使用計算機（廠牌、功能不拘）（單選題共 20 題） 共 3 頁第 1 頁  
每題正確答案得 5 分，錯誤答案倒扣 1 分，未作答者，不給分亦不扣分

1. A Lithium Ion battery module is rated at 12V/6Ah. Two modules, connected in series, are discharged by 0.5C constant current for 1 hour. Determine the total energy released from the battery modules.  
(A) 144Wh  
(B) 72Wh  
(C) 36Wh  
(D) 18Wh
2. In a DC circuit, a load is connected to a Thevenin's equivalent circuit (Thevenin voltage=200V, Thevenin resistance=10 $\Omega$ ). Determine power supplied by Thevenin voltage when the maximum power is consumed by the load.  
(A) 2000W  
(B) 1000W  
(C) 500W  
(D) 250W
3. Determine power consumption of two resistors in parallel connection. Assume the resistor is 10 $\Omega$  for each and voltage across on the resistor is 10 V.  
(A) 40W  
(B) 20W  
(C) 10W  
(D) 5W
4. Determine the time constant of a RC first-order circuit with C=2F and R=2 $\Omega$ .  
(A) 4s  
(B) 2s  
(C) 0.5s  
(D) 0.25s
5. A series RLC second-order circuit is given with parameters L=4H, C=0.25F, R=40 $\Omega$ . Choose a false statement.  
(A) resonant frequency is 1 rad/s  
(B) damping factor is 10 Np/s  
(C) natural frequencies are -0.101 and -9.899 Np/s  
(D) the natural response is overdamped
6. In an AC circuit, choose a false statement.  
(A) the impedance of a resistor increases with increasing frequency  
(B) the impedance of an inductor increases with increasing frequency  
(C) the impedance is defined as voltage phasor divided by current phasor  
(D) the impedance is not a phasor
7. In TAIWAN, single-phase three-wire 110V is common in domestic power system. Choose a true statement.  
(A) Voltage RMS value is 156 V.  
(B) Voltage RMS value is 110 V  
(C) Voltage RMS value is 78V  
(D) System frequency is 50Hz

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8. How to calculate the average power consumed by an AC circuit?
  - (A) voltage phase times current phasor
  - (B) current phasor square times impedance
  - (C) voltage phasor times current phasor complex conjugate
  - (D) current phasor square times resistance
9. What is the definition of power factor?
  - (A) average power divided by apparent power
  - (B) average power divided by reactive power
  - (C) cosine function of angle different between voltage and current
  - (D) cosine function of impedance angle
10. Determine the power factor of a load with impedance  $10-j10\Omega$ .
  - (A) 0.707 leading
  - (B) 0.707 lagging
  - (C) 0.866 leading
  - (D) 0.866 lagging
11. A PV inverter is operated at grid-connected mode with output power 1kW. Assume grid voltage is  $100V_{rms}$ . Choose a false statement.
  - (A) power factor is 1
  - (B) reactive power is 1kVAR
  - (C) output current is 10A
  - (D) apparent power is 1kVA
12. A delta-connected resistive load  $100\Omega$  per phase is connected to a balanced three-phase three-wire 200V circuit. Choose a true statement.
  - (A) power factor is 0.5
  - (B) reactive power is 1200VA
  - (C) average power is 1200W
  - (D) line current is in phase with the line voltage
13. For an ideal transformer, choose a false statement.
  - (A) input average power is equal to output average power
  - (B) input reactive power is equal to output reactive power
  - (C) input apparent power is equal to output apparent power
  - (D) input complex power is equal to output complex power
14. For a two-winding coupling device in an AC circuit, choose a false statement.
  - (A) stored energy in the coupling device is zero
  - (B) coupling coefficient is less than 1
  - (C) induced voltage is determined by the mutual inductance
  - (D) transformer is a magnetic coupling device
15. For a RLC parallel resonant circuit, choose a false statement.
  - (A) resonant condition is that the admittance of the RLC circuit is pure conductance
  - (B) resonance frequency is determined both L and C
  - (C) quality factor can be increased by increasing R
  - (D) current flowing between L and C is equal to zero at resonance

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16. Voltage across on a load with  $10\Omega$  reactance is  $100\cos(377t)$  V. Determine average power of the load.
- (A) 1000W
  - (B) 500W
  - (C) 250W
  - (D) 0W
17. An ideal buck converter is operated in CCM mode. Input voltage is 20V, output voltage is 10V and load resistance is  $10\Omega$ . Determine the average of the input current.
- (A) 0.5 A
  - (B) 1 A
  - (C) 2 A
  - (D) 4 A
18. An ideal boost converter is operated in CCM mode. Input voltage is 10V and output voltage is 50V. Determine the average voltage across on the inductor.
- (A) 40V
  - (B) 20V
  - (C) 10V
  - (D) 0V
19. A 50hp, 250V, 1200 rpm dc shunt motor with compensating windings has an armature resistance of  $0.06\Omega$ . Its field circuit has a total resistance  $50\Omega$ , which produces a no-load speed of 1200rpm. If input current is 100A, choose a false statement.
- (A) armature current=95 A
  - (B) armature voltage=244.3 V
  - (C) motor speed=1115 rpm
  - (D) induced torque=190 N·m
20. A two-pole, 60Hz induction motor supplies 15kW to a load at a speed of 2950 rpm. Choose a false statement.
- (A) synchronous speed=3000 rpm
  - (B) slip=1.67%
  - (C) induced torque=96 N·m
  - (D) motor speed is 2900 rpm if the applied torque is double