Agricultural and Biosystems Engineering Dept. 9/30/97
Iowa State University CJB

Name _____

# AST 363 - Exam 1

Part 1 Closed Book
Multiple Choice: 2 pt. each

1. The maximum instantaneous voltage to ground occurring on a 120/240 v single phase system is about:

   a) 240 V
   b) 120 V
   c) this depends on the type of meter used.
   d) 170 V
   e) 0 V
   f) 84.6 V
   g) 115 V

2. In an AC circuit, power is used by

   a) resistances
   b) capacitances
   c) inductances
   d) all of the above
   e) (a) & (b)
   f) (a) & (c)
   g) (b) & (c)

3. When an extra series load is added to a series circuit,

   a) voltages across and currents through other loads are not changed.
   b) voltages change, but currents remain the same.
   c) currents change, but voltages remain the same.
   d) voltages across and currents through other loads change.

4. Cone heater resistances measured with the resistance meter were less than resistances computed using current and voltage readings because

   a) meters tend to read low on the resistance scale.
   b) DC resistance is less than AC resistance.
   c) of resistance of the conductors leading to the cone heater
   d) resistance of metal goes up as temperature increases.

5. An ammeter placed in parallel with a load will

   a) read correctly the current through the load.
   b) shut off almost all the current to the load.
   c) cause a short circuit, but no damage to the meter.
   d) cause a short circuit and possibly ruin the meter.
   e) read correctly the voltage across the load
   f) rrectly the voltage across the load.

6. The RMS value is shown on the dial of most AC meters because

   a) this is the only practical way to construct a meter.
   b) use of the RMS value permits calculation of power in AC and DC circuits using the same formula.
   c) this is a strong tradition among meter manufacturers.
   d) a meter which reads in RMS values will last much longer than one reading peak or squared values.

7. The power factor,

   a) is a measure of how much energy the electrons contain while moving along a conductor.
   b) has units called vomps and is the power in watts multiplied by the resistance in ohms.
   c) is less than 1.0 if more current is flowing to the load than is required supply the actual power used by the load.
   d) is a measure of efficiency and is the output power divided by the input power.

8. The volt amps drawn by a load equal the watts drawn by the load -

   a) always
   b) never
   c) when PF < 1
   d) when PF > 1
   e) when PF
   f) 1

9. A certain load operates with a power factor of 0.8. A resistance is placed in parallel with this load. The power factor of the combined load is:

   a) 0.8
   b) < 0.8
   c) > 0.8
   d) b or c depending on whether original power factor was leading or lagging.

10. How long will it take a 4kW load to use 12 kWh of energy?

    a) 3 hour
    b) 1/3 hour
    c) 36 minutes
    d) 3.6 hours
    e) none of the above

11. When a circuit breaker-type ground fault interrupter trips, the circuit neutral is opened,

    a) true
    b) false
    c) depends on brand of device.

12. A GFI will NOT protect a person who contacts

    a) red conductor and earth
    b) black conductor and earth
    c) black conductor and neutral conductor

13. An electric shock victim has gone into ventricular fibrillation.

    a) there is no way to prevent death.
    b) the person might be revived by professional treatment if kept alive until arrives.
    c) the person will come out of fibrillation spontaneously if kept alive by CPR.
    d) this occurs from most shocks and is not considered a dangerous situation.

14. The rotor in a watthour meter

    a) turns at a constant speed whenever a load is on.
    b) turns at a constant speed all the time.
    c) turns at a speed proportional to the load.
    d) varies in speed in a manner not related to the load.

15. In a service entrance panel, the neutral is normally

    a) not switched or overcurrent protected
    b) overcurrent protected, but not switched
    c) switched but not overcurrent protected
    d) switched and overcurrent protected
    e) not brought in because box is grounded

16. In order to switch a light from 4 locations, these switches are needed:

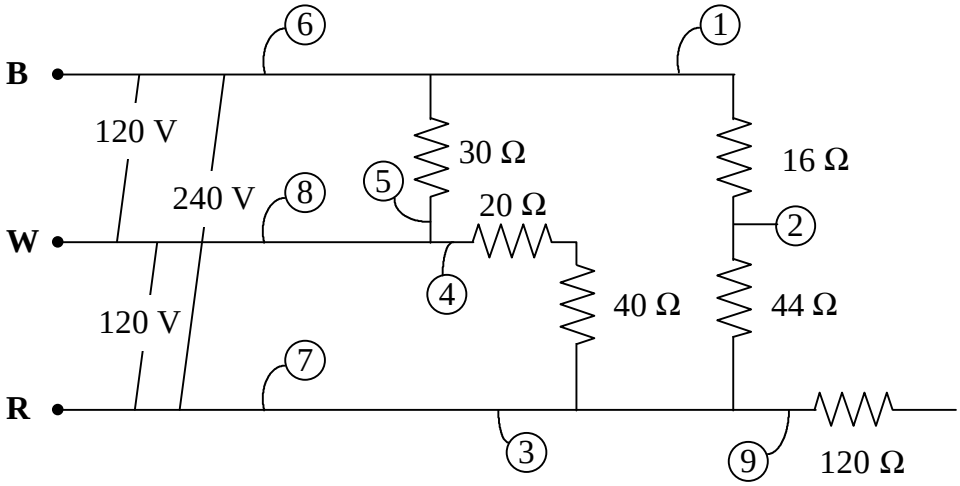
    a) 2-S, 2-S3
    b) 2-S3, 2-S4
    c) 4-S4
    d) 1-S4, 3-S3

(10) 17. Draw the circuit of a service transformer which reduces distribution line voltages down to voltages usable for common electrical loads. Indicate all connections to earth, and all wire colors that are commonly used.

Sept. 30, 1997
CJB

Part 2 Open book & notes Name _____

18. (9)




Compute:

$I_1$

$I_2$

$I_3$

$I_4$

$I_5$

$I_6$

$I_7$

$I_8$

$I_9$

19. (24)

An electric motor draws 30 amps and 7 kW when connected to a 240-Volt line.

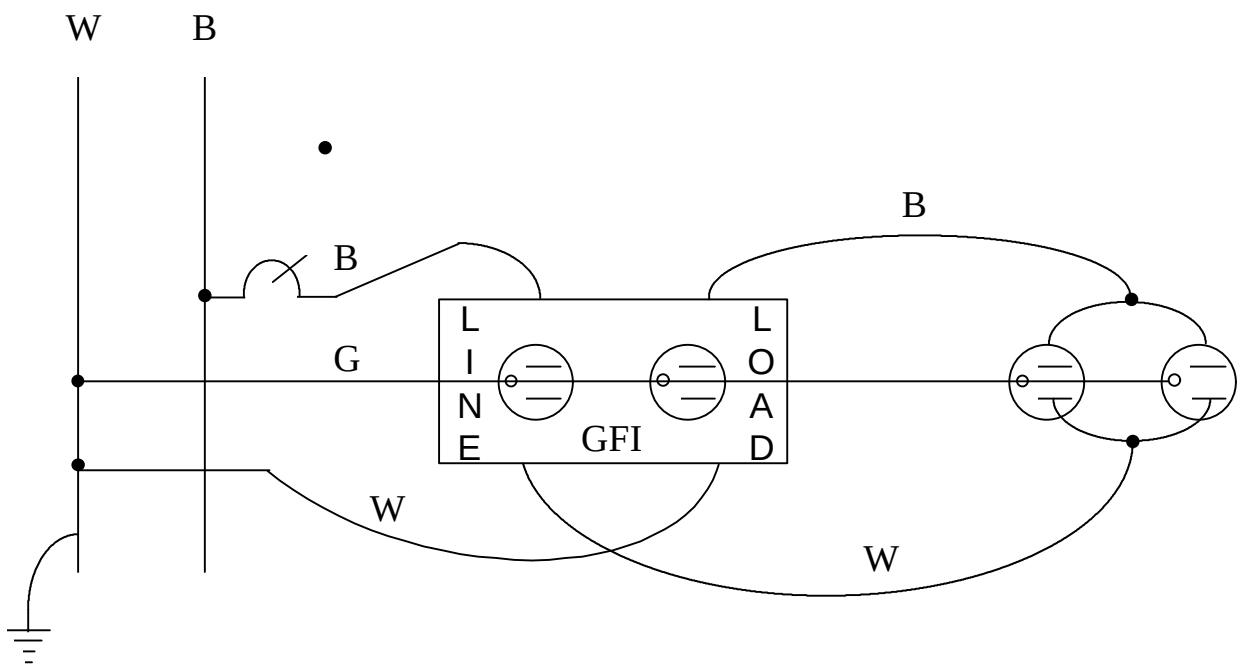
a) Compute motor impedance and express in rectangular notation.

b) Compute power use by the resistive component of the impedance.

c) Compute the size of capacitor (in μF) which will correct the motor power factor to 1 when connected in parallel.

d) Compute current to the motor-capacitor combination with the capacitor in place.

20. (15)




A GFI is wired as shown. Using your knowledge of GFI operation, explain what will happen in each case, and why:

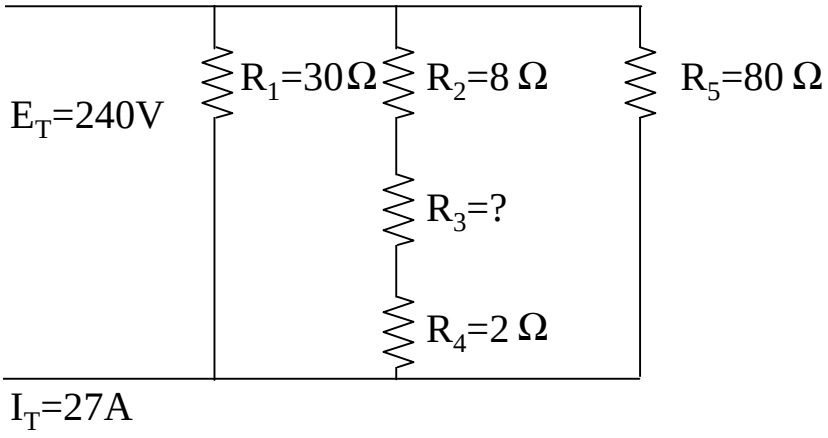
Case 1 A load, but no ground fault on the GFI receptacle.

Case 2 A load but no ground fault on the conventional receptacle.

Case 3 A ground fault but no load on the GFI receptacle.

Case 4 A ground fault but no load on the conventional receptacle.

21. (10)




Compute the value of $R_3$.

What power is used by $R_4$?

What is the equivalent resistance of the entire circuit?