Agricultural and Biosystems Engineering Dept. 11/11/97
Iowa State University CJB

Name _____

AST 363 - Exam 2

Part 1 Closed Book
Multiple Choice: 2 pt. Each

1. An electric motor is controlled by a start-stop station through a magnetic motor starter. When the stop button is pushed, the motor stops, but re-starts when the button is released. Probable cause:

   a) an overload switch stuck open.
   b) coil short-circuited.
   c) auxiliary contacts stuck closed.
   d) auxiliary contacts stuck open.
   e) none of the above

2. A portable sander has this type of motor:

   a) repulsion start induction run
   b) 3-phase
   c) shaded pole
   d) universal
   e) soft-start

3. A fractional HP motor, on examination is found to have a squirrel cage rotor, no starting switch, and two lead wires. This is a

   a) 3-phase motor
   b) split-phase motor
   c) shaded pole motor
   d) universal motor
   e) repulsion start - induction run
   f) on start - induction run

4. If a proper HP motor cannot start its load, the first solution to consider

   a) try the same HP motor in a type with a higher starting torque.
   b) try the next larger HP motor.
   c) try a motor of the same HP with fewer poles
   d) try a motor of the same HP with more poles
   e) decrease motor pulley size

5. This is an advantage of ball-type bearings in motors, as compared with sleeve bearings.

a) quietness
b) initial cost
c) ability to accept radial thrust
d) low friction

6. The breakdown torque of an electric motor is:

a) the torque at which the motor shaft may twist off.
b) the torque at the last point on the torque - speed curve where a decrease in speed will result in an increase in torque.
c) the torque at which the stator field suddenly breaks down
d) another term for the locked rotor torque.

7. A low-cost general purpose motor will have

a) a code letter toward the end of the alphabet.
b) a code letter toward the beginning of the alphabet.
c) no code letter.
d) a code letter anywhere in the alphabet.

8. On a motor circuit, a current higher than the full-load current, but less than the locked rotor current would be regarded as:

a) a short circuit
b) a ground fault
c) an overcurrent
d) a, b, or c

9. With the rotor locked, a motor under test develops 33 lb ft of torque. The motor is developing this HP:

a) 0
b) 0.0019
c) 5260
d) 33
e) none of the above

10. If a capacitor is installed in parallel with a split phase motor,

a) the starting torque of the motor will be improved
b) the efficiency of the motor will be improved
c) the phase angle between the current and voltage for this combination will, be different than for the motor alone.
d) a & b

e) a & c
f) b & c
g) a, b, & c

11. An induction motor must have slip when under load because

a) there must be relative motion between rotor and rotating field in order to have a torque ecerted on the rotor.
b) without slip, the rotor will overspeed and might fly apart.
c) the slip causes a cushioning effect which prevents sudden rotor speed fluctuations.
d) without slip the rotor would turn too fast for most loads.
e) slip is what keeps the windings cool

12. The load on a 1/2 HP induction motor is increases to 1 HP. When this is done, the motor will

a) stop.
b) slow to about 1/2 of full load speed.
c) maintain full load speed.
d) slow to about 95% of full load speed.
e) light up like a Christmas tree

13. If the starting switch on a split phase motor is stuck closed,

a) the motor will not start by itself.
b) the motor will start normally, but the starting winding will overheat within a short period of time.
c) the motor will start, but will not reach normal speed
d) the motor will start and run with no difference in operation.
e) the motor will start and run backwards

14. If a conductor size for a 150 foot feeder was selected on the basis of ampacity, probably with the load on

a) the conductor will overheat
b) there will be too high a voltage at the load
c) there will be excessive voltage drop in the conductor
d) the conductor will not overheat and voltage drop will be very small

15. The ampacity of a conductor is NOT dependent on

a) size of conductor
b) material of conductor
c) proximity to other conductors
d) conductor length
e) material of insulation

16. a) Sketch the circuit of a dual voltage capacitor start - induction run motor wired for high voltage.

b) Sketch the circuit of the same motor wired for low voltage and for running in the opposite direction.

Part 2: Open book and notes 11/11/97
Show your work

Name _____

(22) 17. A capacitor start-induction run electric motor has this nameplate information:

230V	singlephase	7.5 hp	1725 rpm	40 amps
code: L	Insulation: B			

These data were taken while the motor is driving a 4-hp load: 230V, 3.8 kW 19A

a) What is the speed of the motor as it runs this load?

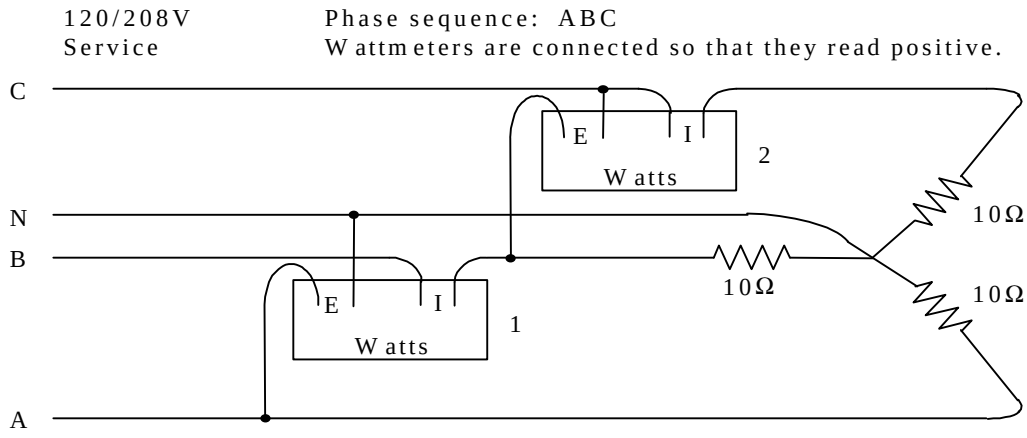
b) What power factor of the motor as it runs this load?

c) What is the efficiency of the motor as it runs this load?

d) What is the output torque of the motor as it runs this load?

e) What torque is this motor capable of producing as it starts a load?

(20) 18.



a) What power is the load using?

b) Sketch a phasor diagram showing what voltage and current wattmeter 1 sees, and calculate the power measured by wattmeter 1.

c) Sketch a phasor diagram showing what voltage and current wattmeter 2 sees and calculate the power measured by wattmeter 2.

(20) 19. Aluminum triplex is to be extended from a constant 240-V panel to a 5-hp single-phase, 230-volt motor. A 2% design voltage drop is specified.

a) How far can the motor be placed from the panel?

b) What voltage does the motor see after it has started, if it is fully loaded, when the circuit from (a) is used?

c) Specify by NEMA number a non-locking plug and receptacle for this motor.