

# electrical module 3 past papers

Answer FIVE questions choosing THREE questions from section A and TWO questions from section B in the answer booklet provided.  
 Maximum marks for each part of a question are as indicated.  
 Candidates should answer the questions in English.  
 Take:  $\epsilon_0 = 8.85 \times 10^{-12} \text{ F/M}$

This paper consists of 6 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

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Turn over

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2601/304

*1. Bawa Miswaka  
2. Increase magnetic flux.*

## SECTION A: MACHINES AND UTILIZATION

Answer THREE questions from this section.

1. (a) (i) State two reasons for keeping the air gap of a three phase induction motor short.  
 (ii) List three reasons for skewing rotor slots of a three phase squirrel cage motor. *1. To reduce crawling, 2. Prevents cogging - magnetic locking of rotor and stator, 3. Improves efficiency.* (5 marks)
- (b) With aid of a labelled block diagram, explain the cascade connection speed control method of two induction motors. (6 marks)
- (c) A 6 pole and 8 pole induction motors are connected in cumulative cascade. The frequency of the 8 pole motor is 5 Hz. Determine the:  
 (i) Combined speed of the cascade on 50 Hz supply;  
 (ii) Slip of each machine. (9 marks)

2. (a) State the two significances of slip in a three phase induction motor. (2 marks)
- (b) A stepper motor has a step angle of  $3^\circ$  and a stepping frequency of 3800 pulses/second. Determine the:  
 (i) Resolution  
 (ii) Number of steps to make 30 revolutions;  
 (iii) Number of revolutions per second. (6 marks)

- (c) (i) Explain the stages of obtaining a d.c supply for electric traction to a series motor from a three phase supply;  
 (ii) With aid of a speed-time curve, explain the duty cycles on a train operating on a mains service line. (12 marks)

$E_g = \frac{10 \times 2\pi}{60} N$

$E_g = \sqrt{I_a R_A} + I_a R_{sc}$

3. (a) (i) With reference to electric drives, distinguish between active and passive loads.  *$E_g = 240 - (15 \times 0.5) + (1.7 \times 16)$*

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- (ii) State three factors which affect the mechanical choice of a motor for a particular electric drive. *- type of load, - power supply, - nature of load, - whether a.c or d.c* (5 marks)
- (b) With aid of a labelled circuit diagram, explain the regenerative braking of alternating current (a.c) electric motors. (5 marks)



State two assumptions made while deriving the expression for heating and cooling of an electric motor. (2 marks)

*The motor is run as a generator. The kinetic energy of the motor is converted into electrical energy and returned to the supply. The field winding is disconnected from the supply and the field current is increased by exciting it from another source. As a result, induced EMF exceeds the supply voltage and the drive is powered.*

# Module One Electrical Principles Past Paper

**SJ Ball**



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