# THE UNITED REPUBLIC OF TANZANIA NATIONAL EXAMINATIONS COUNCIL CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

081

ELECTRICAL INSTALBATION (For Both School and Private Candidates)

Time: 3 Hours

Friday, October 21, 2005 a.m.

#### Instructions

- 1. This paper consists of sections A, B and C.
- 2. Answer all questions in sections A and B and three (3) questions from section C.
- 3. Electronic calculators are not allowed in the examination room,
- 4. Cellular phones are not allowed in the examination room.
- 5. Write your Examination Number on every page of your answer booklet(s).



CPE

This paper consists of # printed pages.



### SECTION A (10 marks)

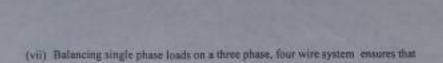
# Answer all questions in this section.

For each of the items (i) - (x) choose the correct answer from among the given alternatives and write its letter beside the item number.

Gill

- For remote control of a direct on line contactor starter, start buttons are wired in
  - series and stop buttons are also wired in series
  - parallel and stop buttons are also wired in parallel B
  - series and stop buttons are wired in parallel
  - parallel and stop buttons are wired in series D
  - series parallel to stop buttons.
- (ii) The ratio of true power to apparent power is used to find
  - reactive volt ampere
  - B load factor
  - energy
  - D power factor
  - current ratio-
  - (iii) The rotating field produced by the stator of a 3 phase induction motor travels at
    - a speed above a synchronous speed
    - a speed below a synchronous speed B
    - the same speed as the rotor
    - a synchronous speed D
    - E high speed.
  - (iv) In a d.c. motor, the back e.m.f. is given by

    - $$\begin{split} E &= V I_a R_a \\ E &= V + I_a R_a \end{split}$$
      B
    - $E = V + I_a R_a$ C
    - D
    - E = V x I<sub>a</sub>R<sub>a</sub> E = I<sub>a</sub>R<sub>a</sub> V
  - (v) A short circuit test in a transformer determines
    - copper losses
    - B iron losses
    - constant losses
    - D mechanical losses
    - power losses
- (vi) A double wound transformer delivers 500 V to a load taking 500 kV A. The current taken by the load is
  - 100 A
  - B 500 A
  - 1000 A
  - 5000 A
  - 50 mA



minimal neutral current flows B line voltages are all equal

star point is maintained all the time

circuit fuses operate efficiently D

current flows to neutral conductor.

(viii) In a three phase star connected circuit, the ratio of line voltage  $\pm \sqrt{3}$  gives

the voltage to neutral

the voltage across two lines

the permissible voltage drops

neutral/earth voltage

earth leakage voltage.

(ix) The permissible voltage drop on consumer's installation supplied by 110 V is

B 5.25 V

C 2.75 V

D 1.33 V

(x) In an induction motor, per unit slip(s) is/are found by the expression

$$A = S = (N_0 - N_0) \times N_0$$

$$\begin{array}{lll} A & S = (N_1 - N_2) \times N_1 \\ B & S = (N_1 - N_2) + N_3 \\ C & S = (N_1 + N_3) - N_0 \\ D & S = (N_2 + N_3) + N_3 \\ \end{array}$$

$$E = S = (N_5/N_R)N_R$$

# SECTION B (30 marks)

Answer all questions in this section.

- What is the difference between a flexible cable and a flexible cord?
- What types and how many switches are required to control lights from four different stations?
- What are the reasons for fitting a protective switch-gear in an installation? State three (3) reasons.
- What are the methods of reducing stroboscopic effect? State three (3) methods.
- Why do we get dim light from the series connected bulbs? State two (2) reasons. 6.
- State three (3) types of fuses fitted in electrical switch gears.
- What is the purpose of a polarity test in a new installation? H
- Express two (2) laws of illumination by formula.



- 10. Differentiate the following electrical accessories:
  - (i) joint box
  - (ii) junction box.
- 11. How can you reverse the direction of rotation of a 3 phase a.c. induction motor?

#### SECTION C (60 marks)

Answer three (3) questions from this section.

- 12. A 60 kVA 3 phase transformer is immersed in a tank containing 2000 litres of insulating oil. The efficiency of a transformer at full load is 97 %. Calculate the average rise in temperature of the oil in degrees Celcius after 3 hours of running at full load and unity power factor, assuming that 60 % of heat energy lost in a transformer is expanded in heating oil. The specific heat capacity of pil is 2140 I/kgk". Density of oil is 898 kg/m .
- 13. The power input to a six pole, 3 phase, 50 Hz induction motor is 42 kW, the speed is 970 revimin. The stator losses are 1.2 kW and the friction and windage loss is 1.8 kW. Calculate the:
  - synchronous speed
  - (b) slip in percent

  - (c) brake horse power (d) rotor copper loss
  - (e) efficiency
- A 220V shunt motor takes a total current of 80 amperes and runs at 500 rev/min. The shunt field resistance is 50 ohms and the armature resistance is 0.1 ohm. Calculate:

  - (i) field current. (ii) armature current. (iii) back e.m.f.

  - (iv) power input to the motor.
- A four-pole shunt generator with lap-connected armature, supplies a load of 200 amperes at 100 V.
   The shunt field resistance is 50 ohms and armature resistance is 0.05 ohms. Calculate the:

  - (ii) field current. (ii) armature current.
  - (iii) electromotive force generated if the voltage drop across brushes is 2 volts.
  - (iv) power output generated.
- The cost of electrical power to a consumer is Tsh. 600 per annum per kVA of maximum demand plus. Tsh. 50 per unit. A consumer maximum demand is 450 kW at 0.72 p.f. lagging and his annual. consumption is 720,000 kwh. Calculate the:

  - kVA of maximum demand.
     annual cost of the maximum demand.
     (iii) overall cost of the year.
     (iv) average price per unit.