THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION, 1990

081 ELECTRICAL INSTALLATIONS

TIME: 3 Hours

INSTRUCTIONS

1. This paper consists of two sections, A and B.
2. Answer ALL questions in section A, and then attempt only FOUR questions from section B. Section A carries 40% and section B carries 60%. All work should be done in the provided answer book.

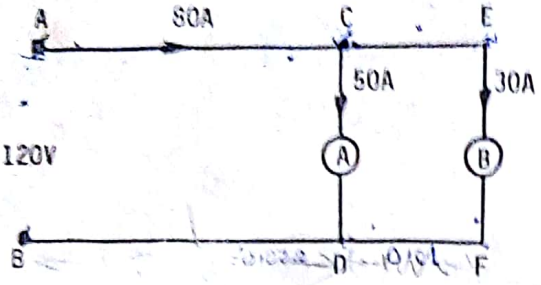
This paper consists of 4 printed pages.

SECTION "A"

1. Name two methods used to improve the power factor of an installation.
2. What are the names of the devices which are used in connection with discharge lamps that perform the following functions?
   (i) To increase the voltage necessary for starting of a fluorescent lamp.
   (ii) To raise the power factor.
   (iii) To suppress the effect of radio frequency on lighting of a fluorescent lamp.
3. What is the difference between a circuit-breaker and a fuse?
4. List four possible causes of a d.c. motor failing to start.
5. Name three types of final sub-circuits.
6. Give the difference between an "Alarm switching" and "Time switches."
7. Given that the total power in a single-phase circuit is 1.8KW, at 0.9 p.f. and a pressure of 250V, what should be the input current?
8. Name the tools one would require in installing metal conduits.
9. Name two types of a.c. motors and state where each type can be used.
10. Explain with the use of a diagram how you would measure the power in a single-ph circuit.
11. What are the essential requirements for
    (a) a conductor, and (b) an insulator? Give two examples of each.
12. The following terms are used in the I.E.E. tables:
    (a) Ambient temperature and (b) Rating factor. What do they mean?
13. What are the reasons for carrying out earthing tests? Give any two reasons.
14. The term "SPLITTING THE PHASE" is used in connection with single-phase motors, what does it mean and why is it necessary?
15. What current will flow in an inductance of 0.2H when connected across a 100V, 50H supply?
16. Name any three types of losses in D.C. machines.
17. Draw a two-way switching circuit used for stairs and corridors.
18. State what you understand by "earth continuity conductor".
19. Which of the following metallic parts are required by the Regulations to be earthed:
    (a) Cable sheaths; (b) cable fixing clips
    (c) metal cases of electric fires
    (d) accessible structural steel work.
    (e) lamp caps?
20. Give the meaning of (a) candela (or candle power), (b) lumen.

SECTION "B" (60%)

21. In a 2-wire d.c. system of the distribution shown in Fig. 1, calculate the potential difference across each load.



DB = 200m
FD = 100m
the resistance of the distributor ACEFDB is 0.01 ohms per 100m.

Fig. 1

22. (a) State three principal types of wiring systems.
(b) State six factors upon which the choice of a particular wiring system depends.

23. (a) What is mean't by the following terms.
(i) Resistivity,
(ii) Temperature coefficient of resistance ?

(b) A cable 50 metres long carries a current of 40A at 20^{0}C, and the total voltage drop along the cable is 8V.
Calculate the cross-sectional area of the cable at 60^{0}C if the resistivity of copper is 1.7 micro-ohm-cm and the temperature coefficient of copper is 0.004 ohm per ohm per degree centigrade.

24. Calculate the e.m.f. generated by a shunt generator which is delivering 15A at a terminal voltage of 440V. The armature circuit resistance is 0.15 ohms, the resistance of the shunt field is 300 ohms and a voltage drop of 2V occurs at the brushes.

25. A single-phase alternating current circuit comprises of a resistance coil of 20ohms and an inductive coil of inductance 0.1 henry and of negligible resistance connected in series.
A voltage of 240v at 50 Hertz is supplied to the ends of the circuit. Calculate:
(i) the current in the circuit
(ii) the potential difference across each element in the circuit.

26. (i) Explain the following terms, and give the range in each case.
(a) Extra-low voltage, (b) Low voltage
(c) Medium voltage.
(ii) Under what conditions do I.E.E. Regulations apply to the installation of cables for extra-low voltage circuits?
(iii) Under what conditions can 250-v cables be used in three-phase circuits?

27. (a) Define the specific heat capacity of a substance.

(b) A tank containing 100 litres of fuel oil is heated by means of a 750-W immersion heater. Assume that the overall efficiency of the operation is 80%, calculate the time required to raise the temperature of the oil from $10^{o}C$ to $35^{o}C$.

Explain how the efficiency of the operation could be improved.

[1 litre of fuel-oil weighs 0.89kgf; specific heat capacity of oil is 1890J/Kg.^{o}C.

1 Kwh = 3.6MJ]