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

081 ELECTRICAL INSTALLATION

TIME : 3 hours 22 January 1989 AM

Instructions

1 This paper consists of Sections A and B. Section A has twenty (20) questions and Section B has six (6) questions.

2 Answer ALL TWENTY (20) questions in Section A and any FOUR (4) questions from Section B.

3 Section A carries 60% and Section B, 40% of the marks.

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SECTION A

Attempt ALL questions in this section. Each question carries 3 marks.

1. State the factors which are important when choosing a motor for a particular application.
2. Name the three parameters used in the calculation of the resistance value in a metal conductor.
3. Name two advantages of miniature circuit breakers over cartridge fuses.
4. What are the factors considered in determining a wiring system for use?
5. What are the four essential requirements for an insulator?
6. State the two main parts in a d.c. machine.
7. What do you mean by the term "protective multiple earthing"?
8. Why is a capacitor start necessary in a single phase induction motor?
9. State four requirements necessary in a steel conduit wiring system
10. State the number of 13A socket outlets including spurs that may be connected as a ring circuit in a floor area not exceeding $100m^2$
11. What types of fluxes must be used when making electrical joints?
12. Briefly explain the stroboscopic effect in a discharge lamp.
13. Why is the filament of a tungsten lamp formed in a coil?
14. State only two methods which can be used to improve the power factor of an installation.
15. Mention three methods of measuring the resistance of a wire.
16. If the fusing factor is 1.5 and the minimum current (fusing current) that causes an element to blow is 7.5A, calculate the current rating of the fuse element.
17. Mention the two possible causes for a neon tube to flicker.
18. Define the following terms as shown in the IEE Regulations - definitions;
    (a) circuit
    (b) arm's reach
19. Why is the iron core of a transformer laminated?
20. What is a PEN conductor?

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SECTION B

Attempt FOUR (4) questions from this section. Each question carries 10 marks

21 A 4-pole, 500v shunt motor is lap-wound with 500 armature conductors. The armature resistance is 0.12 ohm and the flux per pole is 0.09 Wb.

Calculate the respective speeds of the motor when the power outputs are such that the armature currents are 30A and 50A respectively.

22 A classroom with an area of 6 metres by 4 metres is to have an average illumination of 110 lux. The lamps chosen have an efficiency of 40 lm/w. The coefficient of utilisation is estimated to be 0.5 and a maintenance factor of 0.7 is to be allowed.

Calculate the cost of energy consumed during a period of 13 weeks, of 5 days per week and 3 hours per day at full load. The tariff is a flat rate of 90 cents per unit.

23 (a) Define the term "power factor" and explain how a low power factor affects the size of cable required to carry a given a.c. load.

(b) A 240v a.c. single phase induction motor delivers 16 kW at full load. The efficiency of the motor at this load is 80% at a power factor of 0.75 lagging.

Calculate:
(i) the current drawn by the motor.
(ii) the power in KVA drawn from the supply by the motor.

24 (a) What is the function of a thermostat in an electric water heater?

(b) A domestic consumer requires an immersion heater for a tank containing $0.16m^3$ of water. The water is to be heated from 10° C to 50° C in 3 hours. Calculate to the nearest element size in kW if the efficiency of the heating system is taken as 85%. The specific heat capacity of water is 4187 J/kg°K and density of water is $1000kg/m^3$ (Given coefficient of utilisation = 0.5 and maintenance factor MF=0.7).

25. (a) Define the term "spacing height ratio".

(b) A hall 15m by 20m is to be illuminated to a level of 70 lux. The lamps each have an efficiency of 12 lm/w and spacing height ratio of 1.2 are to be suspended 4m above the floor. Estimate the number of lamps required and the power of each lamp.

26. (a) Mention only two methods used to cool distribution transformers.

(b) A 20 KVA transformer when tested was found to have 700 Watts iron losses and 800 Watts copper losses when this transformer was supplying full load at unity power factor.

Calculate the efficiency of the transformer at unity power factor on;
(i) full load
(ii) half load.

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