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ELECTRICAL ENGINEERING (POWER OPTION) LEVEL 6

ENG/OS/PO/CR/ 03 / 6

Install Electrical Machine

November/December 2025

TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION COUNCIL (TVET CDACC)

WRITTEN ASSESSMENT

Time: 3 HOURS

INSTRUCTIONS TO CANDIDATE

1. Marks for each question are indicated in the brackets.
2. The paper consists of **TWO** sections: **A** and **B**.
3. Attempt **ALL** questions in section A and **ANY THREE** (3) questions in section B.
4. Candidates are provided with a separate answer booklet.
5. **DO NOT** write on this question paper.

This paper consists of FOUR (4) printed pages

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

SECTION A (40 MARKS)

Attempt ALL the questions in this section.

1. During a new mototion, it is highly recommended to have a proper shaft alignment. State THREE effects of poor shaft alignment. (3 marks)
2. An installer is preparing cable trays for a machine room. List THREE advantages of using cable trays in electrical machine installations. (3 marks)
3. Correct cable sizing is necessary for machine installation. State FOUR consequences of using undersized cables. (4 marks)
4. Machine layout should be designed in line with perating procedure. List FOUR importance of conducting a proper electrical machine layout design before installation. (4 marks)
5. All metallic surfaces of an electrical machine must be earthed as one of the safety precautions. Define earthing in the context of safety in an electrical workshop. (2marks)
6. An installer is preparing to mount a 3-phase electrical machine on a reinforced base. List THREE requirements of a good machine foundation. (3 marks)
7. A trainee asks why documentation is emphasized after installation. State TWO reasons for keeping installation records. (2 marks)
8. During the assembly of the motor control panels, various components are used. Name THREE protective devices normally fitted inside a mtol panel distribution board (3 marks)
9. Before connecting a motor to supply, the installer should check the contents of the name plate.why nameplate data is important. (4 marks)
10. After motor installation, key tests are conducte he machine is safe and functional. State FOUR such tests (4 marks)
11. A technician is preparing to install a motor in a humid environment. State THREE measures used to protect theinst moisture ingress. (3 marks)
12. You are contracted to install cables to power a 22 kW motor. State THREE criteria for selecting cables for the installation. (3 marks)
13. up generator is critical to ensure safety, performance, and durability. List TWO critical factors that must be considered when mounting an electrical machine. (2 marks)

SECTION B (60 MARKS)

Attempt Any THREE Questions in This Section

14. A synchronous mobe installed in a cement factory for a large blower.

a) Outline FIVE site conditions to consider before installation. (10 marks)

b) Describe the systematic procedure for terminating electrical cables in this industrial installation. (10 marks)

15.

a) A 1100 V, 50Hz delta-connected induction motor has a star-connected slip-ring rotor with a phase transformation ratio of 3.8. The rotor resistance and leakage reactance are 0.012 ohms and 0.25 ohms per phase, respectively. Neglecting stator impedance and magnetizing current determines:

i. The rotor current at start with slip-rings shorted (2 marks)

ii. The rotor power factor at start with slip rings shorted (2 marks)

iii. The rotor current at 4% slip with slip rings shorted (4 marks)

iv. The rotor power factor at 4% slip with slip rings shorted (1 mark)

v. The external rotor resistance per phase required to obtain a starting current of 100 Amperes in the stator supply lines (5 marks)

b) Synchronous motor operation in industrial settings, there are several methods that can be employed. Outline THREE of these methods used. (6 marks)

16.

a) A 25 kW, 250 V, dc shunt generator has armature and field resistances of 0.06 ohm and 100 ohm, respectively. Determine the total armature power developed when working.

i. As a generator delivering 25 kW (5 marks)

ii. As a motor taking 25 kW input. (3 marks)

b) With digital technologies, condition monitoring of machines has become more reliable.

i. Explain THREE parameters commonly monitored in electrical machines. (6 marks)

ii. Explain THREE benefits of adopting condition monitoring. (6 marks)

17.

a) Alternators are used to convert mechanical energy to electrical energy in power plants. Explain the functions of FIVE major parts of an alternator. (10 marks)

b) Cable routing forms an integral part of machine layout design. Poor routing increases safety risks and reduces efficiency. Explain FIVE factors that guide cable routing in layout design. (10 marks)