071304T4RAC

Refrigeration and Air Conditioning Artisan - Level 4

ENG/OS/RAC/CC/04/4/A

Apply Basic Engineering Science

July/August 2023

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

WRITTEN ASSESSMENT

Time: 2 hours

INSTRUCTIONS TO CANDIDATE

1. This paper has two sections **A and B.**

2. Attempt questions in each section as per instructions given in the section.

3. You are provided with a separate answer booklet.

4. Answer all questions in the answer booklet.

5. Marks for each question are indicated in the brackets.

6. Do not write on the question paper.

This paper consists of FOUR (4) printed pages.

SECTION A (10 MARKS)

Attempt all the questions

1. Fluid mechanics is the study of the behavior of _____ and _____ and particularly the forces that they produce.
   - A. Potential and kinetics
   - B. Science and physics
   - C. Stress and conservation
   - D. Liquid and gases

2. _____ is the study of motion without regard to force.
   - A. Dynamics
   - B. Kinematics
   - C. Conservation
   - D. Physics

3. The _____ states that when one body exerts a force on a second body, the second body simultaneously exerts a force equal in magnitude and opposite in direction on the first body.
   - A. Newton's first law
   - B. Newton's third law
   - C. Newton's second law
   - D. Hooke's law

4. Refrigerators are heat engines that convert _____ energy to heat.
   - A. Chemical
   - B. True
   - C. Mechanical
   - D. Light

5. _____ is the study of heat related to matter in motion.
   - A. Calorimetry
   - B. Thermodynamics
   - C. Fluid mechanics
   - D. Physics

6. When a system changes state in such a way that at any instant during the process the state point can be relocated is said to be _____.

   A. Wearing

   B. Polishing

   C. Cutting

   D. Reversible

7. The _____ is a system operating in a complete cycle which converts heat input into work output.

   A. Entropy

   B. Heat engine

   C. Gas system

   D. Car engine

8. A perfect gas may be defined as a gas which obeys the _____

   A. Generation of more heat at electrode tip

   B. Gas law

   C. Charles law

   D. Joules law

9. In _____ process, no heat transfers across the boundary.

   A. Adiabatic

   B. Polytrophic

   C. Isobaric

   D. Isothermal

10. The function of a nozzle is _____.

   A. Decreases the velocity of a fluid at the cost of its pressure gain

   B. Increases the velocity of a fluid at the cost of its pressure drop

   C. Increases the velocity of a fluid and also its pressure

   D. None of the mentioned.

SECTION B (40 MARKS)

Attempt ALL the questions

11. Define the following terms   (4 marks)

    (a) Convention

    (b) Radiation

12. List the FOUR major components in an air conditioner machine   (4 marks)

13. Manometers are instruments used to measure _____   (1 mark)

14. State at least FOUR disadvantages of using a manometer   (4 marks)

15. The _____ is a thermodynamic cycle that generates refrigerating effects where the working fluid absorbs the heat from the surrounding at a low temperature and reject the heat to the atmosphere at a higher temperature   (2 marks)

16. Pascal's law states that _____   (2 marks)

17. Density of a fluid is defined _____   (2 marks)

18. Distinguish specific weight from specific volume of a fluid   (3 marks)

19. If the volume of a fluid is 1m³ and its mass is 10000g, calculate the density of the fluid   (4 marks)

20. In thermodynamics, a closed system is _____   (2 marks)

21. If none of a systems property change with time, the system is said to be in _____ state   (1 mark)

22. Turbulent flow occurs then the _____ particles passing a point vary with time whereas the flow is lamina if the particles in a given layer or streamline _____.   (4 marks)

23. Define the following terms   (4 marks)

    (a) Process

    (b) Cycle

24. The density of mercury is 13600 kgm⁻³. Determine the liquid pressure at a point 76 cm below the surface of mercury. $(13600\,kgm^{-3})\,(9.8\,m/s^2)\,(0.76\,m)$ (3 marks)

$= 101.3\,m$