**Ph.D. COMMON ENTRANCE TEST**

**SUBJECT – FIRE ENGINEERING**

**Roll No:**

**PART B**

**Duration: 60 minutes Maximum Marks: 50**

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| **Instructions:**   1. **This entrance test question paper is not to be taken out of the examination hall** 2. **Question paper consists of Section A and Section B** 3. **Section A consists of 30 MCQs carrying 1 Mark each. Write the Alphabet of the correct answer in the space given.** 4. **Section B consists of Descriptive questions carrying 5 marks each. Restrict your answer to 500 words. Additional plain sheets have been attached to the question paper to answer Section B** |

**SECTION – A**

**Answer the following questions by writing the Alphabet of the correct answer in the Box given: 30 X 1 = 30**

1. In which zone of candle flame there is no combustion?
   1. Innermost
   2. Middle
   3. Outermost
   4. None of the above
2. What are the three elements of fire triangle?
   1. Fuel, water, carbon di oxide
   2. water, carbon di oxide, heat source
   3. Fuel, oxygen, carbon di oxide
   4. Fuel, oxygen, heat source
3. The absolute thermodynamic temperature scale is also referred as?
   1. Celsius scale
   2. Kelvin scale
   3. Fahrenheit scale
   4. None of the above
4. In which unit pressure can be measured?
   1. kg/cm2
   2. mm of water column
   3. Pascal
   4. All the above
5. Stagnation point is the point in fluid mechanics where the velocity of the fluid at that point is \_\_\_\_\_
   1. Unity
   2. Constant
   3. Infinite
   4. Zero
6. Which of the following is the mathematical technique used to predict physical parameters?
   1. Dimensional analysis
   2. Temperature analysis
   3. Pressure analysis
   4. Combustion analysis
7. For conduction heat transfer, the heat energy propagation will be minimal for
   1. Copper
   2. Air
   3. Water
   4. Lead
8. Why fins are provided on a heat transfer surface?
   1. Pressure drop of the fluid should be minimized
   2. Increase turbulence in flow for enhancing heat transfer
   3. Surface area is maximum to promote the rate of heat transfer
   4. Increase temperature gradient so as to enhance heat transfer
9. The products of combustion are
   1. Carbon dioxide and water
   2. Oxygen and water
   3. Only carbon dioxide
   4. Only oxygen
10. Combustion is a reaction in which a Substance reacts with-
    1. Hydrogen
    2. Nitrogen
    3. Oxygen
    4. Chlorine
11. Amount of heat energy produced on complete combustion of 1kg of fuel is
    1. Calorific value
    2. Specific heat of fuel
    3. Burn rate
    4. None of the above
12. Which of the following is an essential component of fire safety in buildings?
    1. Fire-resistant paint
    2. Smoke detectors
    3. Fireworks display
    4. Gasoline storage tanks
13. What is the main cause of smoke inhalation-related deaths in fires?
    1. Toxic fumes
    2. Heat exhaustion
    3. Panic
    4. Carbon monoxide poisoning
14. Which of the following is an example of passive fire protection?
    1. Fire extinguisher
    2. Fire alarm
    3. Fireproof clothing
    4. Fire-resistant wall
15. A small shear force is applied on an element and then removed. If the element regains its original position, what kind of an element can it be?
    1. Solid
    2. Liquid
    3. Fluid
    4. Gaseous
16. Which of the factors primarily decide whether the flow in a circular pipe is laminar or turbulent?
    1. The Prandtl Number
    2. The Pressure gradient along the length of the pipe
    3. The dynamic viscosity coefficient
    4. The Reynolds Number
17. For a fully-developed pipe flow, how does the pressure vary with the length of the pipe?
    1. Linearly
    2. Parabolic
    3. Exponential
    4. Constant
18. For a compressible fluid, if there is no change in specific volume at constant temperature, what type of process it is?
    1. Isothermal process
    2. Adiabatic Process
    3. Polytropic process
    4. None of the mentioned
19. Calculate the pressure exerted by 9 kg of air at a temperature of 20℃ if the volume is 0.8m3. Assuming ideal gas laws are applicable.
    1. 946 kN/m2
    2. 1892 kN/m2
    3. 1419 kN/m2
    4. None of the mentioned
20. Velocity of wind is measured using
    1. Speedometer
    2. Anemometer
    3. Tachometer
    4. Audiometer
21. 1 watt-hour is equivalent to
    1. 6.3 \* 103 J
    2. 6.3 \* 107 J
    3. 3.6 \* 10-3 J
    4. 3.6 \* 103 J
22. Which of the following temperatures show equal reading for both centigrade(°C) and Fahrenheit scale?
    1. -25°
    2. -40°
    3. 35°
    4. 0°
23. Which is the correct order of preferred repeating variables in Buckingham’s method of dimensional analysis?
    1. Geometric, flow, fluid
    2. Fluid, geometric, flow
    3. Geometric, fluid, flow
    4. Fluid, flow, geometric
24. The model and prototype have same forces under
    1. Dynamic similarity
    2. Kinematic similarity
    3. Geometric similarity
    4. All of the above
25. Dimension formula for quantity ‘X’ in the equation Force = ‘X’/density is
    1. M1L4T-2
    2. M2L2T-1
    3. M2L-2T-2
    4. M1L2T-1
26. The area of interest for a CFD analysis is called
    1. Cell
    2. Grid
    3. Mesh
    4. Domain
27. Which of the following is an optimal mesh?
    1. Uniform mesh
    2. Non – uniform mesh
    3. Grid with increasing length
    4. Grid with decreasing length
28. Turbulence problems particularly depend on what term of Navier – Stokes equation?
    1. Convection term
    2. Rate of change term
    3. Diffusion term
    4. Source term
29. What is the physical statement of mass conservation equation for a finite control volume fixed in space?
    1. Net mass flow through the control surface = constant
    2. Rate of change of mass inside the control volume = constant
    3. Net mass flow through the control surface = Rate of change of mass inside the control volume
    4. Net mass flow through the control surface ≠ Rate of change of mass inside the control volume
30. Which of these represents the temperature of the fluid layer immediately near the wall at a condition analogous to no-slip? Where, Tw is the temperature at the wall.
    1. T=-Tw
    2. T=1
    3. T=Tw
    4. T=0

**Section - B**

**Answer any four questions (Each question carry 5 marks 4\*5 = 20**

1. Is production of hydrogen from splitting water, for the purpose of clean energy production a viable option? Justify your answer

2. Electrical vehicles have become a necessity for urban life. Do you agree? Justify your answer.

3. Write down the stoichiometric equation for methane and hence determine the stoichiometric air to fuel ratio and mass of water formed per gram of methane. If higher calorific value of methane is 50 MJ/kg find its lower calorific value. Assume enthalpy of vaporisation of water to 2.2 MJ/kg.

4. Discuss the significance of radiation mode heat transfer in fires.

5. List various losses in pipe flows. Explain how pressure drop in pipes are determined.

6. Discuss various dimensionless numbers relevant to heat transfer processes.