

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-IV (NEW) EXAMINATION – WINTER 2020****Subject Code:2140907****Date:09/02/2021****Subject Name:Applied Thermal and Hydraulic Engineering****Time:02:30 PM TO 04:30 PM****Total Marks:56****Instructions:**

1. Attempt any FOUR questions out of EIGHT questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain in brief about the significance of the above subject in the field of electrical engineering. **03**
- (b) Illustrate in brief, at least two innovations in the field of applied thermal and hydraulic engineering. **04**
- (c) Explain in brief about four recent developments in the field of applied thermal and hydraulic engineering. **07**
- Q.2** (a) Give a broad classification of hydraulic turbines. **03**
- (b) Define the following; **04**
- 1) degree of reaction, 2) NPSH, 3) specific speed, 4) priming of the pump.
- (c) What do you mean by cavitation? Explain the cavitation phenomenon in detail. State the places in the turbines and pumps where cavitation is generally occurred. **07**
- Q.3** (a) What do you mean by guide blades? State function/s of guide vanes/blades for the turbines and pumps. **03**
- (b) Enlist various flow measuring devices and pressure measuring devices. **04**
- (c) State and prove Bernoulli's equation. **07**
- Q.4** (a) State important properties of the fluid. Define any two of them. **03**
- (b) Illustrate with a neat sketch, construction and working of Pelton Wheel. **04**
- (c) With a neat sketch, discuss in detail, working and construction of Pitot tube. **07**
- Q.5** (a) Define the following; **03**
- 1) Thermal conductivity, 2) emissivity, 3) critical radius of insulation.
- (b) 'Aluminum utensils are not preferred for cooking purpose'. Justify. **04**
- (c) What should be the thickness of insulation on a small diameter wire and a steam pipe? Explain the physical significance of the critical radius of insulation in both the cases & derive an expression for the critical radius of insulation for the cylindrical coordinate system. **07**
- Q.6** (a) Define the following; **03**
- 1) Grey body, 2) black body, 3) shape factor.
- (b) 'It is desirable to wear white clothes instead of black clothes during summer season'. Give reasons. **04**

- (c) Write the most general equation in Cartesian Coordinate system for heat transfer by conduction. From the above equation, derive the followings with suitable assumptions; **07**
- 1) Fourier's equation,
 - 2) Laplace equation,
 - 3) Poission's equation.
- Q.7** (a) State applications of Zeroth, First and Second law of thermodynamics. **03**
- (b) What are various methods to improve the efficiency of the Rankine Cycle? Explain any one of them in brief. **04**
- (c) With a neat sketch, explain the construction and working of a simple vapor compression refrigeration (VCR) cycle. Plot the same cycle on T-s and p-h diagram also. **07**
- Q.8** (a) Define following term related to psychrometry; **03**
- (i) wet bulb temperature, (ii) dry bulb temperature, (iii) relative humidity.
- (b) What are various methods to improve the efficiency of the Brayton Cycle? Explain any one of them in brief. **04**
- (c) With a neat sketch explain the Rankine cycle for thermal power plant. Plot the same cycle on T-s and h-s diagram also. **07**

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