Reg. No. :

Question Paper Code : 50533

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

Third/Fourth Semester

Mechanical Engineering

CE 3391 – FLUID MECHANICS AND MACHINERY

(Common to Aeronautical Engineering/Aerospace Engineering/Industrial Engineering/Industrial Engineering and Management/Manufacturing Engineering/Materials Science and Engineering/Mechanical Engineering (Sandwich)/Mechanical and Automation Engineering/Production Engineering and Safety and Fire Engineering)

(Also Common to PTCE 3391 – Fluid Mechanics and Machinery for B.E. (Part-Time) – Second Semester – Mechanical Engineering – Regulations 2023)

(Regulations 2021)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define density and specific weight.

2. Define – Incompressible fluid.

3. What is the expression for head loss due to friction in Darcy formula?

4. What is Moody diagram?

5. List the basic dimensional units in dimensional analysis.

6. Name the methods for determination of dimensionless groups.

7. What is meant by Cavitations in turbines?

8. List the important characteristic curves of a turbine.

9. Define volumetric efficiency in pumps.

10. What is NPSH?

PART B — (5 × 13 = 65 marks)

11. (a) Explain the various types of fluids with suitable sketches.

Or

(b) Derive the continuity equation with suitable assumptions.

12. (a) Derive the Darcy-Weisbach equation for calculating pressure drop in pipe.

Or

(b) Derive the expression for momentum thickness using suitable assumptions.

13. (a) Determine the dimensions of the quantities given below :

(i) Angular velocity,   (2 + 2 + 2 + 3 + 2 + 2)

(ii) Angular acceleration,

(iii) Discharge,

(iv) Kinematic viscosity,

(v) Force,

(vi) Dynamic viscosity.

Or

(b) The resisting force R of a supersonic plane during flight can be considered as dependent upon the length of the aircraft I, velocity V, air viscosity μ, air density ρ and bulk modulus of air K. Express the functional relationship between these variables and the resisting force.

14. (a) What is an air vessel? Describe the function of the air vessel for reciprocating pump with neat sketch.

Or

(b) Draw and discuss the characteristic curves of centrifugal pumps.

15. (a) Explain the working of Kaplan turbine and construct its velocity triangles with a neat sketch.

Or

(b) With a neat sketch, explain the construction and working of Pelton wheel.

16. (a) The aerodynamic drag of a new sports car is to be predicted at a speed of 50.0 mile/h at an air temperature of 25°C. Automotive engineers build a one-fifth scale model of the car to test in a wind tunnel. It is winter and the wind tunnel is located in an unheated building; the temperature of the wind tunnel air is only about 5°C. Determine how fast the engineers should run the wind tunnel in order to achieve similarity between the model and the prototype.

Or

(b) The head available at a location was 1500 m. It is proposed to use a generator to run at 750 rpm. The power available is estimated at 20,000 kW. Investigate whether a single jet unit will be suitable. Estimate the number of jets and their diameter. Determine the mean diameter of the runner and the number of buckets.

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