DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Regular End Semester Examination – Summer 2022

Course: M. Tech. Branch : M.Tech. Mechanical Engineering Semester : II

Subject Code & Name: MMECH21 Advanced Fluid Mechanics & Heat Transfer

Max Marks: 60 Date: 17/10/2022 Duration: 3 Hr.

Instructions to the Students:

1. *Each question carries 12 marks*
2. *Attempt any five questions from the following.*
3. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
4. *Use of non-programmable scientific calculators is allowed.*
5. *Illustrate your answers with neat sketches, diagrams etc. Assume suitable data wherever necessary and mention it clearly.*

		(CO)	Marks
Q. 1	**Solve the following.**		
A)	Derive continuity equation in Cartesian co-ordinates for 3 dimensional fluid flow.	CO1	6
B)	Explain Eulerian and Lagrangian approach for fluid flow analysis.	CO1	6
Q.2	**Solve the following.**		
A)	Explain stream function and velocity potential function with neat sketches.	CO2	6
B)	Explain Reynold's Transport theorem.	CO 2	6
Q. 3	**Solve the following.**		
A)	What do you understand by Navier Stokes equations? Write the equation along x-y direction. What are the application Navier Stokes equations.	CO 3	6
B)	Explain the implicit and explicit finite difference method. Also state advantages and disadvantages of each method.	CO 3	6
Q.4	**Solve the following.**		
A)	Write differential equation of heat conduction in Cartesian co-ordinates. Also write following equations: i) Fourier Equation ii) Poission Equation iii) Laplace Equation	CO 1	6
B)	Explain initial and boundary conditions for the following cases: i) Temperature boundary conditions. ii) Heat flux boundary conditions. iii) Convection boundary conditions.	CO 3	6

Q. 5 Solve the following.

A)	Explain the applications of Heisler and Grober charts in transient heat conduction.	CO 1	6
B)	A copper cylinder 10 cm diameter, 20 cm long is removed from liquid nitrogen bath at -196 ℃ and exposed to air at 25 ℃ with convection coefficient of 20 W/m^2K. Find the time required by the cylinder to attain the temperature of -110 ℃. Take properties as: C = 380 J/kgK, ρ = 8800 kg/m^3, k = 360 W/mK	CO 4	6

Q. 6 Solve the following.

A)	Explain the regimes of pool boiling curve with neat sketch.	CO 2	6
B)	Explain hydrodynamic and thermal boundary layer for a flow over a flat plate with neat sketches.	CO 6	6

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