Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV • EXAMINATION – SUMMER 2013

Subject Code: 142101 **Date: 07-06-2013**

Subject Name: Transport Phenomenon in Materials Processing

Time: 10:30am – 01:00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	(i) Explain viscosity?State Newton's Law of Viscosity. Distinguish between kinematic & dynamic viscosity. Derive its unit & dimension. (ii) Explain Classification of fluid.	**04** **03**
	(b)	Calculate the dynamic viscosity of an ail, which is used for lubrication between a square plate of size 0.8m *0.8m and an inclined plane with angle of inclination 30degree. The weight of square plate is 300N and it sl down the inclined plane with a uniform velocity of 0.3m/s. The thickness of oil film is 1.5mm.	**07**
Q.2	**(a)**	State laws of conservation of mass and derive equation of continuity.	**07**
	(b)	A 30cm diameter pipe conveying water branches into two pipes of diameter 20& 15cm, if the average velocity in the 30cm dia pipe is 2.5mt/sec, find the discharge in the pipe. Also determine the velocity in 15cm pipe f the average velocity in 20cm dia pipe is 2mt/sec.	**07**
		OR	
	(b)	What is Fourier law of heat conduction? Derive one dimensional heat conduction equation through a large plane wall.	**07**
Q.3	**(a)**	(i) Define convective heat transfer. Explain the difference between free & forced convection with examples. (ii) Give correlation of heat transfer coefficient with Nusselt number.	**04** **03**
	(b)	Calculate thermal conductivity 'k' of the powder if the inner radius & temperature are Ri = 0.05 m & Ti =450 ^{o}C& outer radius & temperature as Ro=0.10 m & To=300 ^{o}C . It is heated with 150 V & 0.75 amp current.	**07**
		OR	
Q.3	**(a)**	Derive Euler's equation and obtain Bernoulli's equation by its integration.	**07**
	(b)	Water is flowing through a pipe of 5cm diameter under a pressure of 29.43N/cm2 & with mean velocity 2 mt/sec. Find the total head/ total energy per unit wt of the water at a cross section, which is 5mt above the datum line.	**07**
Q.4	**(a)**	Give equation for Newton's law of cooling ? Define Reynolds &Grashof numbers. Where these numbers are used ?	**07**
	(b)	Write in brief about Wein's distribution law and Lambert's law	**07**
		OR	
Q.4	**(a)**	What are the various applications of Bernoulli's equation? State & explain how the rate of flow is measured by venturimeter.	**04** **03**
	(b)	State Newton's second law of motion and derive equation for momentum balance.	**07**
Q.5	**(a)**	Define Diffusivity. Give Fick's first law and second law.	**07**
	(b)	Distinguish betweenSteady diffusion &Pseudo-steady diffusion	**07**
		OR	
Q.5	**(a)**	Derive general equation of mass diffusion in stationary media.	**07**
	(b)	Using differential momentum balance equation, derive Navier-Stokes Equation.	**07**

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