

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), April-May 2015

B. Tech in Chemical Engineering, Semester VI

Roll No.....

CHE 604: TRANSPORT PHENOMENA

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A	Objective type multiple choice questions (10 questions @ 1 mark)	10
i.	In which case specific heat at constant volume is equal to specific heat at constant pressure.	
ii.	How many components are present in a 3rd order tensor quantity?	
iii.	Thermal conductivity of gas at low density..... with increasing temperature.	
iv.	Is the efficiency of a circular fin is greater than a rectangular fin?	
v.	Relation between kinematic viscosity and dynamic viscosity?	
vi.	What is the driving force in mass transport problem?	
vii.	Thermal diffusivity is	
viii.	Bulk modulus of elasticity depends upon.....	
ix.	The value of β for Bingham ideal plastic is.....	
x.	The value of β for Thixotropic fluid is.....	
Q.2	Short answer type questions (4 questions @ 2.5 marks) Give the following models of Non-Newtonian fluids	10
i)	Bingham model	
ii)	Ostwald - de waele model	
iii)	Ellis model	
iv)	Eyring model	
Q.3A	What do you meant by "Newtonian and Non-Newtonian"? What type of substance exhibits this behavior?	05
Q.3B	Compare Fourier Law of Conduction with Newton Law of Viscosity.	05
Q.4A	How does viscosity vary with Temperature and Pressure for dilute gas and liquid?	05
Q.4B	State and explain Fick's law of diffusion.	05
Q.5A	What are various analogies between heat and mass transfer?	05
Q.5B	Discuss time-smoothed in energy equation	05



Q.6A	Derive an expression for effectiveness of fin.	05
Q.6B	Discuss time-smoothed equation of change and velocity profile.	05
	OR	
Q.6B	Discuss in brief equation of continuity.	05
Q.7A	State and explain kirchoff's law of radiation.	05
Q.7B	Discuss in detail about the properties of fluid like density, viscosity and specific weight.	05
	OR	
Q.7B	Explain Hagen-Poiseuille equation for laminar flow of incompressible fluid in a circular tube.	05
Q.8A	Derive an equation for heat conduction for cooling fin.	10
Q.9A	Derive Navier - Stoke equation.	10
Q.9B	A liquefied gas is storage in a wall insulated spherical container, vented to the atmosphere. The radii of the inner walls and outer walls are r_0 and r_1 respectively. The temperature T_0 (at $r = r_0$) and T_1 (at $r = r_1$) are known. The thermal conductivity of insulation varies with temperature as follows: $k = k_0 + (k_1 - k_0) \left(\frac{T - T_0}{T_1 - T_0} \right)$ Show that the study state heat transfer rate is given by $Q = 4\pi r_0 r_1 \left(\frac{k_0 - k_1}{2} \right) \left(\frac{T_0 - T_1}{T_1 - T_0} \right)$	10
	OR	
Q.9B	Find the equation for heat conduction with a nuclear source.	10