



UNIVERSITY OF PETROLEUM & ENERGY STUDIES
Examination, July 2020

Programme: B.Tech APE UP

Course Name: Transport Phenomena in Geosystems

Course Code: PEAU 2007

No. of Pages: 04

Semester : 4th

Max. Marks : 100

Instructions: All question are compulsory.

Section – A: It has time duration is 2 hrs.

Section - B: It has time duration is 24hrs. The Students should clearly mention Student Name, SAP ID and Roll Number at top of the answer script for this section. The 50% marks will be deducted if plagiarism is found. The student's signature is required on each page of the assignment at the right side bottom of the page.

SECTION - A (Attempt all the questions)
(60 × 1 marks)

Sl. No.	MCQs	Marks	CO
Q.1	(a) The transport phenomena is related to : a. fluid dynamics b. heat transfer c. mass transfer d. all the above	1	CO1
	(b) The fluid dynamics involves the transport of : a. momentum b. energy c. chemical species d. all the above	1	CO1
	(c) Heat transfer involves the transfer of: a. momentum b. energy c. chemical species d. all the above	1	CO1
	(d) Mass transfer is concerned with the transport of _____ chemical species : a. mass b. energy c. momentum d. all the above	1	CO1
	(e) According to the law of conservation of mass, the total mass of the molecules entering and leaving the collision must be _____: a. equal b. less than input c. greater than input d. none of these	1	CO1
	(f) According to the law of conservation of momentum the sum of the momenta of all the atoms before the collision must _____ that after the collision : a. equal b. less than input c. greater than input d. none of these	1	CO1
	(g) In newton's law of viscosity, the proportionality constant is called : a. velocity b. viscosity c. density d. kinematic viscosity	1	CO1
	(h) The convective momentum transport is proportional to the fluid_____. a. velocity b. viscosity c. density d. kinematic viscosity	1	CO1

	(i)	Energy can also be transported by the bulk motion of a fluid, and this is referred to a : a. molecular energy transport b. convective energy transport c. radiative energy transport d. all the above	1	CO1
	(j)	The rate of heat flow per unit area is proportional to the _____. a. heat b. energy c. temperature d. all the above	1	CO1
	(k)	In Fourier's law, the proportionality constant is called : a. temperature gradient b. energy gradient c. thermal conductivity d. all	1	CO2
	(l)	The thermal conductivities of most liquids decreases with _____ temperature. a. increasing b. decreasing c. equal d. none of these	1	CO2
	(m)	The thermal conductivities of gases _____ with increasing temperature. a. increases b. decreases c. same d. none of these	1	CO2
	(n)	The molecular transport of one substance relative to another is known as _____. a. mass diffusion b. concentration diffusion c. both a & b d. none of these	1	CO2
	(o)	The ratio of momentum diffusivity to the thermal diffusivity is known as: a. Prandtl number b. Schmidt number c. Lewis number d. none of these	1	CO2
Q.2	(a)	The ratio of momentum diffusivity to the mass diffusivity is known as: a. Prandtl number b. Schmidt number c. Lewis number d. none of these	1	CO2
	(b)	The ratio of thermal diffusivity to the mass diffusivity is known as: a. Prandtl number b. Schmidt number c. Lewis number d. none of these	1	CO2
	(c)	The unit of the mass diffusivity is : a. cm square/sec b. cm/sec c. sec/cm d. sec/cm square	1	CO2
	(d)	The mass per unit area is called : a. mass flux b. heat flux c. momentum flux d. all the above	1	CO2
	(e)	In the Fick's law of diffusion, the proportionality constant is called : a. thermal diffusivity b. momentum diffusivity c. mass diffusivity d. all the above	1	CO2
	(f)	The kinematic viscosity is: a. density X viscosity b. density/viscosity c. viscosity/density d. none of these	1	CO3
	(g)	A "reduced" quantity is one that has been made dimensionless by dividing by the corresponding quantity at the _____. a. bubble point b. dew point c. critical point d. all the above	1	CO3
	(h)	The viscosity of a gas at low density _____ with increasing temperature, whereas the viscosity of a liquid _____ with increasing temperature. a. increases, decreases b. decrease, increases c. increases, increases d. None	1	CO3
	(i)	The reduced viscosity can be calculated by: a. viscosity/critical viscosity b. critical viscosity/viscosity c. both a & b d. None	1	CO3
	(j)	The reduced temperature can be calculated by: b. temperature/critical temp. b. critical temp./temp. c. both a & b d. None	1	CO3
	(k)	The reduced pressure can be calculated by: c. pressure/critical press. b. critical press./press. c. both a & b d. None	1	CO3
	(l)	Fourier's law is used for the : a. radiation b. convection c. conduction d. all of these	1	CO3
	(m)	The heat flux is proportional to the temperature _____ over the distance a. increases b. decreases c. no effect d. none of these	1	CO3

	(n)	The literature of heat transfer generally recognizes distinct modes of heat transfer. How many modes are there? a. One b. two c. three d. four	1	CO3
	(o)	Unit of the rate of heat transfer is: a. Joule b. Newton c. Watt d. Pascal	1	CO3
Q.3	(a)	Thermal conductivity is defined as the heat flow per unit time a. When the temperature gradient is unity b. Across the wall with no temperature c. Across unit area where the temperature gradient is unity d. Through a unit thickness of the wall	1	CO3
	(b)	Diffusion can occur in _____ materials. a. Solid b. Liquid c. Gaseous d. All	1	CO2
	(c)	The most influencing factor of diffusivity is a. Diffusing species b. Temperature c. Lattice structure d. Presence of defects	1	CO2
	(d)	Find the operation where diffusion of solids not occurs a. Adsorption b. Leaching c. Drying d. Distillation	1	CO2
	(e)	_____ porosity is the fractional void space with respect to bulk volume regardless of pore connections. a. Absolute b. effective c. total d. none of these	1	CO4
	(f)	_____ porosity is that fraction of the bulk volume constituted by interconnecting pores. a. Absolute b. effective c. total d. none of these	1	CO4
	(g)	Which parameters affecting the permeability of porous media? a. compaction b. clay swelling c. leaching d. all of these	1	CO4
	(h)	The effective permeabilities may range from zero to k, the relative permeabilities may have: a. 0 to 1 b. 0 to 1.5 c. 0 to 0.9 d. both a & c	1	CO4
	(i)	The sum of the relative permeabilities is both variable and always a. less than or equal to unity b. less than unity c. greater than unity d. none	1	CO4
	(j)	Critical saturation is measured in the direction of _____ saturation. a. increasing b. reducing c. both a & b d. none of these	1	CO4
	(k)	In the largest void spaces the motion of a fluid is only partially determined by the walls of the void: these largest spaces are referred to as _____. a. Caverns b. total pore space c. interstices d. none of these	1	CO4
	(l)	Solution cavities of small size are referred to as vugs and the void space formed by these is called _____ pore space. a. vugular b. total c. caverns d. none of these	1	CO4
	(m)	In the smallest void spaces molecular forces between the molecules of the solid and those of the fluid are significant. These tiniest void spaces are termed molecular _____. a. vugular b. interstices c. caverns d. none of these	1	CO4
	(n)	Those spaces which are intermediate in size between molecular interstices and caverns are termed _____. a. pores b. interstices c. caverns d. none of these	1	CO4
	(o)	The unit of porosity is: a. darcy b. milidarcy c. unit less d. all the above	1	CO4
Q.4	(a)	Porosity is defined as : a. bulk volume/pore volume b. pore vol/bulk vol. c. both a & b d. none of these	1	CO4

(b)	_____ is the process of volume reduction due to an externally applied pressure. a. consolidation b. compaction c. both a & b d. none of these	1	CO4
(c)	_____ refers to the binding together of the elements of the solid matrix by a cementing material. a. consolidation b. compaction c. both a & b d. none of these	1	CO4
(d)	What is the SI unit of apparent viscosity? a. Pascal – second b. Pascal c. Newton – second d. Newton / hr	1	CO4
(e)	The S.I unit of kinematic viscosity (ν) is _____ a. m/s square b. m square /s c. m/s d. m.s square	1	CO1
(f)	Change in momentum is a. the result of powers acting on the surface of the control volume b. the result of works acting on the surface of the control volume c. the result of forces acting on the surface of the control volume d. none of the above	1	CO1
(g)	If the layers of fluid have frictional force between them, then it is known as: a. Viscous b. non-viscous c. incompressible d. both a & b	1	CO1
(h)	If the every particle of the fluid has irregular flow, then the flow is said to be: a. Laminar flow b. turbulent flow c. fluid flow d. both a & b	1	CO1
(i)	If every particle of fluid follows the same path, then flow is said to be: a. Laminar flow b. turbulent flow c. fluid flow d. both a & b	1	CO1
(j)	Unit of thermal conductivity in M.K.S. units is a. Kcal/kg m ² C b. kcal-m/hr m ² C c. kcal-m/hr C d. none of these	1	CO1
(k)	Unit of thermal conductivity is S.I. units is a. W/m K b. J/m K sec c. both a & b d. none of these	1	CO1
(l)	Thermal conductivity of solid metals with rise in temperature normally: a. Increases b. decreases c. remains constant d. unpredictable	1	CO1
(m)	When heat is transferred from one particle of hot body to another by actual motion of the heated particles, it is referred to as heat transfer by: a. Conduction b. convection c. radiation none of these	1	CO1
(n)	When heat is transferred from hot body to cold body, in a straight line, without affecting the intervening medium, it is referred as heat transfer by : a. Conduction b. convection c. radiation none of these	1	CO1
(o)	When heat is transferred by molecular collision, it is referred to as heat transfer by: a. Conduction b. convection c. radiation none of these	1	CO1

SECTION - B (Attempt all the questions)
(4 × 10 marks)

Q.5	The transport phenomena play most important role in the fluid flow in the porous media. Recall contribution of fluid mechanics in transport phenomena. Define thermal diffusivity and its dimensions.	10	CO4
Q.6	The injection of water flooding play most important role in the secondary recovery method of enhanced oil recovery. List the objective and factors considered while selecting flooding pattern.	10	CO4
Q.7	The production of the reservoir depends upon the relative permeability of reservoir. Illustrate the two-phase relative permeability curve for a gas-oil system.	10	CO3

Q.8	Diffusion of any substance depends on the some basic law of diffusion. Derive an expression for vector form of Fick's Law of Binary Diffusion.	10	CO3
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