OPEN BOOK EXAM

Menofia University	Subject : Bio-Mathematics
Faculty of Engineering	Code: BES 508
Basic Engineering Sci. Department	Time Allowed: 3 hours
Academic Year: 2017-2018	Year : Master
Date : 04 / 06 / 2018	Total Marks: 100 Marks

Allowed Tables and Charts: All allowed (Open Book)

<u>Answer all the following questions:</u> [100 Marks]

Q.1 ***<u>Write brief notes on the following topics:</u>*** [20]

1. What is biomathematics? And Why to study biomathematics?
2. Show the steps of constructing a mathematical model.
3. Biomechanics and Bio-fluid mechanics, view point of blood flow.
4. Define the Peristaltic Motion and state some examples in a human body?
5. Define the Pulsatile Flow and state some examples in a human body? And define the Womersley Number (α)?

Q.2 Consider a two-dimensional channel of mean width 2d, filled with a mixture of small spherical rigid particles in an incompressible Newtonian viscous fluid under slip condition. The walls of the channel are flexible on which are imposed travelling sinusoidal wave with constant amplitude a (Peristaltic). The vertical displacements of the upper and lower walls ($y = d$ and $y = -d$) are thus presumed to be η and η, respectively, x and y are Cartesian coordinates with x measured in the direction of wave propagation and y measured in the direction normal to the mean position of the walls. [20]

Q.3 Consider an axisymmetric flow of a mixture of small spherical solid particles and an incompressible Newtonian viscous fluid through a uniform circular cylindrical tube. The tube wall is flexible on which are imposed travelling sinusoidal wave with constant amplitude b (Peristaltic motion). The flow in cylindrical coordinates (r, z) with z [20]

	measured in the direction of wave propagation, whereas r stands for the radial coordinate. Write the mathematical model of this problem.	
Q.4	Consider an axisymmetric flow of a mixture of small spherical solid particles and an incompressible Newtonian viscous fluid through a uniform circular cylindrical tube. The tube wall is flexible on which are imposed travelling sinusoidal wave with constant amplitude b (Peristaltic motion). The flow in cylindrical coordinates (r, z) with z measured in the direction of wave propagation, whereas r stands for the radial coordinate. Write the mathematical model of this problem.	[20]
Q.5	Let us consider the axially symmetric and fully developed pulsatile flow of blood in an axisymmetric cylindrical artery of radius R through porous medium with body acceleration under the influence of an external uniform transverse magnetic field. Blood is assumed to be Newtonian, incompressible, electrically conducting and viscous fluid. The fluid subjected to a constant magnetic field acts perpendicular to the artery. Assume that the magnetic Reynolds number of the flow is taken to be small enough.	[20]

This exam measures the following ILOs								
Question Number	Q1-a	Q1-b	Q3-b	Q4-a	Q1-c	Q2-a	Q3-a	Q4-c
	Q4-b				Q2-b	Q2-c	Q3-c	
	Knowledge &understanding skills				Intellectual Skills		Professional Skills	

Good Luck

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