OPEN BOOK EXAM

الامتحان مفتوح (مسموح باستخدام كل شيئ داخل اللجنة)

Menofia University Faculty of Engineering Basic Engineering Sci. Department Academic Year : 2019-2020 Date : 28 / 08 / 2020		Subject : Bio-Mathematics Code: BES 508 Time Allowed : 3 hours Year : Master Total Marks: 100 Marks

Allowed Tables and Charts : All allowed (Open Book)

Answer all the following questions: [100 Marks]

Q.1 *Write brief notes on the following topics:* [20]

1. Biomathematics? And Why to study biomathematics?
2. Bioengineering and Biomathematics and its applications.
3. Biomechanics and Bio-fluid mechanics, view point of blood flow.
4. Biomedical engineering and its new career areas.
5. Biomaterials and its applications.
6. Bioenvironmental engineering and Biosensors engineering.
7. Define the Peristaltic Motion and state some examples in a human body?
8. Define the Pulsatile Flow and state some examples in a human body? And define the Womersley Number (α)?
9. Show the steps of constructing a mathematical model.

Q.2 Consider pulsatile flow of an incompressible couple stress fluid between two permeable beds through a porous medium in the presence of magnetic field. The fluid is injected into the channel from the lower permeable bed with a velocity V and is sucked into the upper permeable bed with the same velocity. The flow between the permeable beds is governed by couple stress fluid flow equations of Stokes. Let the x-axis be taken along the interface and the y-axis perpendicular to it. Let $y = o$ and $y = h$ represent the interfaces of the permeable beds under consideration. The flow as axially symmetric and fully developed. Draw the geometry of the problem. Write the mathematical model. [20]

Q.3	Consider a two-dimensional channel of uniform thickness $2d$, filled with a compressible viscous liquid. The walls of the channel are deformed in the shape of a traveling sinusoidal wave with constant amplitude a (Peristaltic motion). 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. Write the mathematical model of this problem.	[20]
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	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. Draw the geometry of the problem, then Write the mathematical model of this problem.	[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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