



کراچی یونیورسٹی
University of Karachi
Department of Mathematics
MATH 803 • Modeling of Biological Systems I

Time Allowed: 2 hours • Maximum Marks: 50 • Date: Wednesday, March 11, 2010 • Paper Format: A

Student's Name _____ (in CAPITAL LETTERS using a "marker")

Attempt all questions. Each part of Question 1 is of 7 marks and that of Questions 2-4 is of 4 marks. Note down the time spent on solving each part of question and time spent on revision by making the following "Time Chart" on the answerbook front page (2 marks). Time spent on revision must be at least 10% of the total time.

Question No.	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	Revision
Time (minutes)											

a) DO NOT TURN PAPER AROUND unless the invigilator says: *Start now*

b) This is a closed-book examination. Deposit all BOOKS, NOTES, MOBILE PHONES (switched off), DIGITAL DIARIES and LAPTOPS in the designated area. Remove everything from your desk, except markers, pens, pencils, stapler and calculator.

c) If you want to use a calculator, **it must bear a "sticker"** displaying your NAME and your SEAT NUMBER, large enough so that it is visible from a distance of 5 meters. **Absolutely, NO sharing of calculators.**

d) Use your own material. **Nothing can be borrowed from or given to** a friend.

e) The papers may be of different formats. Therefore, work on your own **without consulting anyone** (We have a record of your seating arrangement).

f) Write your "NAME" on all pages of **your question paper** (5 marks shall be deducted for failing to comply) [NOTHING ELSE SHOULD BE WRITTEN ON THE QUESTION PAPER] and **"PAPER FORMAT"** on the front page of **your answerbook** (the upper-right-hand corner) and the **Yellow Sheet** using a "marker". Start your work from **Page 2** of your answerbook. The only thing that could be written on the front page is the "Time Chart" (see above) and the "Honor Statement" (see below).

g) The following statement must be copied on the front page of your answerbook and signed (2 marks): "My signatures, below, testify that I am the person, whose name and photograph appear on the Admit Card. Upon my honor, I declare that the following work is my own, completed without giving or receiving unacknowledged help, without copying, or the use of any unfair means." Signatures _____

h) This paper contains TWO PAGES (this page and the back page). On invigilator's signal (Start now) turn the paper around, check if you have the back page printed, correctly. Last line of the second

page reads: <END>. Start working on the paper, immediately.

i) Put your pens down and your papers turned (so that this page is facing you) and the FRONT PAGE of your answerbook should be facing you as soon as you hear "ALL PENS DOWN". Failure to do as directed shall result in "deduction of 5 marks" from your score.

j) If you use extra copies, it is "your responsibility" to write YOUR NAME, COPY NUMBER and all OTHER INFORMATION on each copy used. All the extra copies must be stapled with the main copy, before turning in your paper (you may wish to bring in a stapler with you for this purpose).

k) If you have a question of "Fill in the blanks" in your paper you must write the complete sentence with the filled word underlined.

l) Nobody is allowed to leave the examination hall, **for whatsoever reason**, once the examination has started. Bring your own DRINKING WATER.

m) Students are not allowed to LEAVE THEIR SEATS or STAND UP during the examination. If you have a query, "raise your hand" and someone will help you.

n) All work, including rough work, must be on the official answerbook. No extra sheet may be used.

o) Students are *not* allowed to use RED anywhere. All work (except figures) must be in pen or ballpoint.

p) The result shall be displayed on my homepage on **Wednesday, March 24, 2009 at 1500h**. DO NOT contact the Course Supervisor. Students are not permitted to see the answerbooks.

q) Anyone found cheating in the examination should be facing disciplinary action, which may result in **EXPLUSION** or **SUSPENSION** for 2 or more years. **Absolutely, no conversation among students. DON'T TURN THE PAPER, YET.** Wait for "signal" from the invigilator.

Student's Name _____ (in CAPITAL LETTERS using a "marker")

- 1-a) Compute the obesity profile of the following female aged more than 19 years (SGPP-KHI-20090329-01)
[height = 160.2 cm; mass = 89.7 kg; clothing correction = 1.0 kg]:

Height (cm): _____
 Height (ft-in): _____
 Percentile for Height: _____
 Gross Mass (kg): _____
 Clothing Correction (kg): _____
 Net Mass (kg): _____
 Net Weight (lb-oz): _____
 Percentile for Mass: _____
 BMI: Biomass Index (kg/m^2): _____
 Optimal Mass (kg): _____
 Optimal Weight (lb-oz): _____
 Δ Mass-for-Height (kg): _____
 Δ Weight-for-Height (lb-oz): _____
 Status (Obese/Wasted/Just Right): _____

Using the height and weight data:

	Percentiles	3	5	10	25	50	75	90	95	97
Females	Height (cm)	151.50	152.50	154.75	159.00	163.50	167.50	172.50	174.00	175.25
	Mass (kg)	45.25	46.50	48.25	52.25	55.25	66.00	75.25	82.50	88.75
Males	Height (cm)	163.00	165.00	167.50	172.00	176.50	182.00	185.50	188.00	190.00
	Mass (kg)	54.50	56.00	58.25	63.25	70.50	79.00	89.00	96.00	101.00

- 1-b) List 7 similarities of moiré fringe topography and rasterstereography.
 2-a) By drawing a diagram explain ICP model of growth. Which hormone is released during infancy-to-childhood phase transition and which during childhood-to-puberty phase transition?
 2-b) In the ICP-time-series graph, which physiological parameters are represented by the x and the y intercepts? What is the difference between recumbent length and standing height? Which one is greater?
 3-a) List step-by-step procedures for measurement of standing height.
 3-b) List the sources of error and sources of hazard/injury in the measurement of weight.
 4-a) By drawing a diagram explain the heart cycle.
 4-b) Which mathematical property is the guiding principle in screening for spinal curvatures, in particular scoliosis. By drawing a rough diagram of back indicate the early-warning signals.
 5-a) By taking a common example, indicate difference between accuracy and precision. Write down the formulae for computing accuracy and precision and define each symbol.
 5-b) What is the concept of reproducibility? Differentiate between stability and objectivity.