



کراچی یونیورسٹی
University of Karachi
Department of Mathematics
MATH 610 • Biomathematics II

Time Allowed: 2 hours • Maximum Marks: 80 • Date: Friday, December 19, 2014 • Paper Format: A

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

Attempt all Questions. Each part of **Question 1** is of 4 marks and that of **Questions 2-4** is of 10 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	1c	1d	2	3	4	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 **Monday, January 5, 2015 at 0900h**. **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 as per University of Karachi rules. **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) What do the following abbreviations stand for?
i) BIA • ii) BMI • iii) DEXA • iv) SGPP
- 1-b) List 4 similarities of moiré fringe topography and rasterstereography.
- 1-c) Give 4 arguments the parents, generally, give against allowing doctors to X-ray their children for detection of scoliosis.
- 1-d) When a child is standing facing the examiner, clue of any back asymmetry could be uneven _____ (*hip joint, knee joint, scapulae*). Kyphosis is accentuated curvature in the _____ (*frontal, sagittal, transverse*) plane. Tolerance levels set for statuses (pertaining-to-mass) and (pertaining-to-height) are _____ (0, 1, 2) percent. According to the paper, 'Stunting Induced by Wasting — Wasting Induced by Stunting: A Case Study'. A child, who is tall and obese may have _____ (*under-nutrition, over-nutrition, energy-channelization problem*).
- 2-a) Compute the growth profile for the following female child (SGPP-KHI-20110412-01/01: NGDS-BLA-2010-5484/A) [date of birth = 2005-06-16, date of measurement = 2014-11-23, height = 136.56 cm, height of father = 178.20 cm, height of mother = 170.78 cm] (percentile of height, percentile of mid-parental height, estimated-adult height in cm, estimated-adult height in ft -in, status pertaining-to-height)
- 2-b) Compute the obesity profile for the above child [dress code = 0/0.5, gross mass = 33.06 kg] (percentile of mass, estimated-adult mass in kg, estimated-adult mass in lb-oz, optimal mass in kg, status pertaining-to-mass)
- 3) Write short notes on any TWO of the following:
 - a) The NGDS Pilot Project
 - b) Estimated-Adult BMI
 - c) 3-D-Imaging Techniques
- 4-a) i) Define scoliosis and kyphosis? (4 marks) ii) Which mathematical property is the guiding principle in screening for spinal curvatures, in particular, scoliosis? (2 marks) iii) Give 2 reasons to explain why it is mandatory for the child to be in dress code 0/0.5 for screening of scoliosis. (2 marks) iv) By drawing a rough diagram of back, indicate the early-warning signals. (2 marks)
- 4-b) Write down the formulae for mean and gaussian curvatures. (4 marks) Prove the formula to compute local curvature (d is the apparent spacing of raster grid, projected on the curved surface, s is the actual spacing): (6 marks)

$$\kappa = \pm \frac{1}{s} \sqrt{6(1 - \frac{d}{s})}$$

Web address of this document: http://www.ngds-ku.org/M609-10/Exams609-10/610-14_Paper.pdf
(to be uploaded 12 hours after the conclusion of examination)

Exam paper solution: **To be announced after the declaration of result**