# UNIVERSITY OF GHANA



## BACHELOR OF SCIENCE IN ENGINEERING
## SECOND SEMESTER EXAMINATIONS: 2014/2015

## CPEN ~~434~~ 412: WEB SOFTWARE ARCHITECTURE (3 Credits)

**INSTRUCTION:** *Answer ALL questions from Sections A and B.*

**TIME ALLOWED:** *TWO-AND-HALF ($2^1/_2$) HOURS*

### SECTION A

*Answer **ALL** questions in this section.*

**A1 [25 marks]**

a) The *Hypertext Transfer Protocol (HTTP)* is fundamentally *stateless* and *anonymous*. Do you agree with this assertion? Explain your answer. [4 marks]

b) Describe any three techniques by which a *stateful user experience* can be developed over an HTTP protocol. [6 marks]

c) Explain in detail, with examples, the following architectural bases of the Web as indicated by the World Wide Web Consortium (W3C) :

   *i) Identification of resources.* [3 marks]

   *ii) Interaction between agents and resources.* [3 marks]

   *iii) Representation of resources.* [3 marks]

d) Using the URI of the University of Ghana's website, http://www.ug.edu.gh, describe the anatomy of a typical HTTP session. [7 marks]

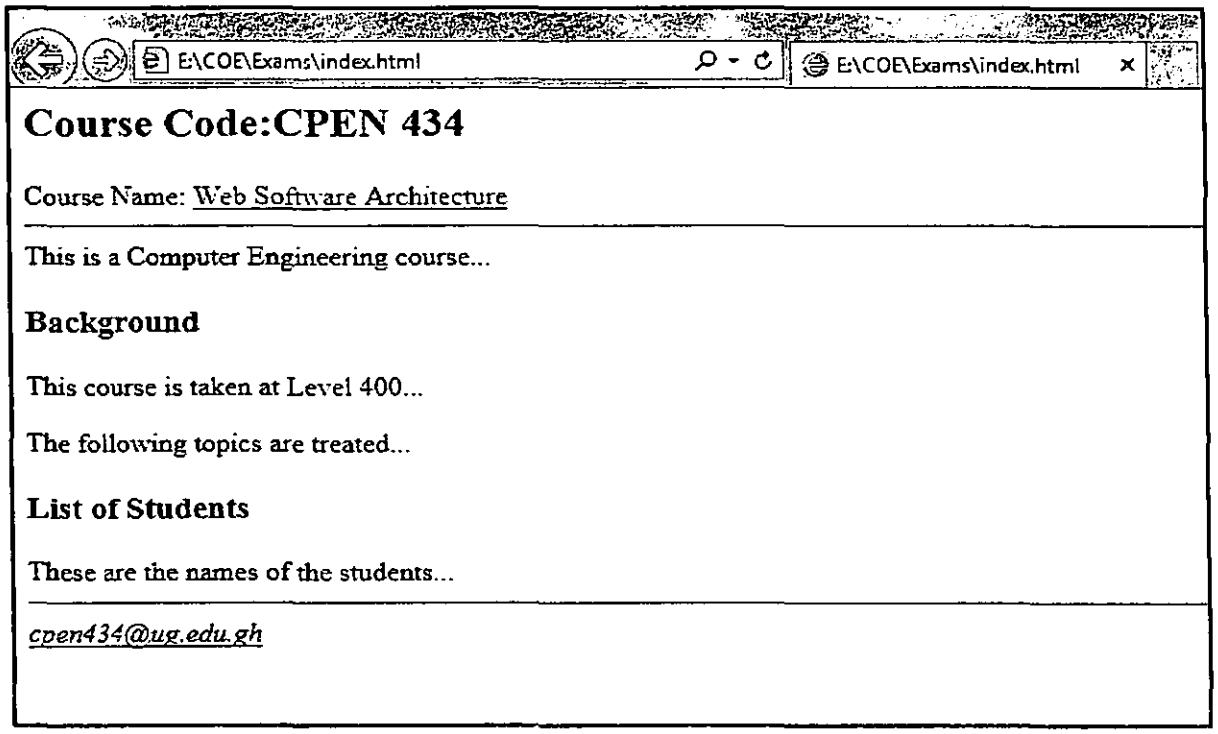
**A2 [25 marks]**

a) Explain three factors that make the relational database management system (RDBMS) the dominant technology for persistence behind a Web server. [6 marks]

b) State the "ACID test", as proposed by IBM, in evaluating whether or not a DBMS is powerful enough for a Web application. [4 marks]

c) Describe four steps that can be taken to develop a database driven Web application. [8 marks]

**d)** Write html codes to implement the following page: [7 marks]




**SECTION B**

*Answer **ALL** questions in this section.*

**B1 [50 marks]**

Suppose that you a software engineer responsible for developing a database backed Web application referred to as *GhanaNnipa*. *GhanaNnipa* is expected to support the activities of the National Identification Authority (NIA) in Ghana. One of the main features of *GhanaNnipa* is a Web page that can be used by applicants in requesting for a *Ghana National Identity Card*.

a) Using diagram(s) design a software architecture for *GhanaNnipa* indicating the various components and their roles. [10 marks]

b) State the specific software that could be used to implement the architecture in B1a) in each of the following environments:

   i) Linux or Miscrosoft Windows (but not on the .NET platform). [4 marks]

   ii) .NET (dot NET) platform. [4 marks]

c) Using diagrams design a *user registration* page and a detailed *data model* that can be used to register first time users of *GhanaNnipa*. A first time user may need to provide the following data to be able to register: *First Name, Last Name, Date of Birth, Type of ID, ID Number, Residential Address, User Name* and *Password.*

[12 marks]

d) Assume that the *data model* in question B1.c) is implemented in a database held in a server type database management system (DBMS). Explain how data in the database can be accessed from a web page within *GhanaNnipa*. [4 marks]

e) It is expected that when a user submits a request for a *Ghana National Identity Card*, *GhanaNnipa* (the Web application) verifies the user data from the following database servers:

- *National Birth and Death Database (NDD)* of the Birth and Death Registry held in *Oracle* database management system (DBMS).
- *National Election Register* of the Electoral Commission held in *PostgreSQL.*
- National Census Database of Statistical Service held in *Miscrosoft SQL Server.*

i) Explain in detail, with the aid of diagrams, how the user data can be retrieved from each of the database servers if the database at the National Identification Authority (NIA) is held in *MySQL.*

[10 marks]

f) Using diagrams modify the architecture in B1.a) such that *GhanaNnipa* can support the implementation of a standard web service based on *ISO 19128:2005 Web Map Server (WMS) Specification* to display the *residential address* of applicants on a web page. [Hint: The web service should not use *Google Maps*]. [6 marks]