**Introduction to Demography**
**Pardee RAND Graduate School**
**2016 Spring Quarter**

**Professor Ernesto F. L. Amaral**
**Final Assignment**

**Instructions**
The following questions are related to demographic concepts and methods. Answers to substantive questions should be no more than 150 words (unless otherwise stated) and written in Microsoft Word. Answers to methods questions (marked with an asterisk) should be solved in Microsoft Excel. Students must email their answers to the professor in two files (Word, Excel) by May 13, 2016.

**Questions**

**Class 1 – Introduction**
1. Define demography and explain its main concerns, such as population size, growth/decline, demographic components, and population distribution/structure.

2. Discuss the relative advantages and disadvantages of a youth bulge's impact on society.

*3. Between 1960 and 1975 the population of Indonesia grew from about 100.6 million to 137.5 million. Between 1990 and 2000 it grew from 187.7 million to 225.0 million. Find the growth rates between 1960 and 1975 and between 1990 and 2000. Have the growth rates increased or decreased?

*4. Official U.S. Census counts are shown in Table 1. What were the yearly growth rates and population doubling times between the following years: (a) 1790 to 1900? (b) 1900 to 1950? (c) 1950 to 2000? (d) 1790 to 2000?

**Table 1. U.S. Census counts in millions**

| Year | Population | Year | Population | Year | Population | Year | Population |
|------|------------|------|------------|------|------------|------|------------|
| 1790 | 3.929 | 1850 | 23.192 | 1910 | 91.972 | 1970 | 203.212 |
| 1800 | 5.308 | 1860 | 31.443 | 1920 | 105.711 | 1980 | 226.546 |
| 1910 | 7.240 | 1870 | 39.818 | 1930 | 122.775 | 1990 | 248.710 |
| 1820 | 9.638 | 1880 | 50.156 | 1940 | 131.669 | 2000 | 281.421 |
| 1830 | 12.866 | 1890 | 62.948 | 1950 | 150.697 | 2010 | 308.745 |
| 1840 | 17.069 | 1900 | 75.995 | 1960 | 178.464 | | |

Source: Wachter KW. 2014. Essential Demographic Methods. Cambridge: Harvard University Press. p.28

*5. At mid-year 2012 Brazil, Pakistan, and Nigeria had similar total populations, 194, 188, and 170 million, respectively. Growth rates were 0.011, 0.021, and 0.024 per year. Suppose growth continues at these rates for at least 8 years. Use the exponential model to project populations for these three countries in 2020. Would their rankings change?

**Class 2 – Periods and cohorts**
6. Define and differentiate rates, probabilities, period person-years lived, and cohort person-years lived.

7. Find dates of birth and death for the presidents of the United States from Theodore Roosevelt to Barack Obama. Draw a freehand Lexis diagram with the lifelines of these presidents. Label the axes clearly. You can do this exercise manually, digitalize your diagram, and insert in Microsoft Word.
(a) Draw and label a line representing the age 30 and a line representing the year 1945.
(b) Draw and label the area containing person-years lived by people between the ages of 20 and 30 for the years between 1964 and 1968.
(c) Draw and label the area representing the whole lifetime experience of the cohort aged 10 to 30 in 1917.

*8. Poland has a nearly stationary population, with $e_0 = 76$. There were about 380,000 births in 2012. What was the approximate size of the population?

**Class 2 – Mortality**
9. Define health and mortality transition, including any relation to health and mortality changes over time.

*10. Get data from the UN Population Division website (World Population Prospects: The 2015 Revision) about population and deaths by age groups and sex for two countries (one developing and one developed country). UN mortality data is available for five-year period (e.g. 1950–1955, 1955–1960). Select two five-year periods that are separated by at least three decades. Data for population size should consider the same two five-year periods. Use the same five-year periods for these two countries. If you do not find deaths for the 0–1 age group, estimate life tables starting with the 0–4 age group. Estimate life expectancy for all five-year age groups (up to 80+). Generate a graph for life expectancy by age groups (similar to Figure 5.6 in Weeks, 2015, p. 157) with four curves (one for each five-year period and country). Generate graphs for the age-sex structure (population pyramid) for each five-year period and country, based on actual population and stationary population ($_nL_x$).

11. Interpret the indicators and graphs generated in question #10, emphasizing the differences across time and countries. Explain the process of rectangularization of mortality over time.

**Class 3 – Fertility**
12. Define fertility transition and explain its biological and social components.

13. Explain the proximate determinants of fertility and provide detail about the four main variables.

*14. Obtain data from the UN Population Division website (World Population Prospects: The 2015 Revision) about the female population by age groups and number of births by age of mother and sex for two countries and two five-year periods (use same countries and years as question #10). Estimate total fertility rates, gross reproduction rates, net reproduction rates, and mean length of generation. Use $_nL_x$ from question #10. Estimate all rates considering five-year age groups between 15 and 49 years of age. Generate a graph for age-specific fertility rates by age groups (similar to Figure 6.2 in Weeks, 2015, p. 195) with one curve for Hutterite "natural" fertility, as well as four curves (one for each five-year period and country).

15. Interpret the rates and graph generated in question #14, emphasizing the differences across time and countries.

**Class 4 – Migration**
16. Explain the migration transition and describe the main assessments of theories about migration within and between countries.

17. Discuss the differences between migration stocks and flows, and then show how the two are interrelated in terms of their impact on both receiving and sending societies.

18. Obtain data from the U.S. Census Bureau on migration that has been tabulated in an Excel spreadsheet (http://www.census.gov/hhes/migration/data/). Write a report with no more than 300 words about migration trends to a specific state. Include one table or graph with indicators in the report, containing data through time. Extra migration indicators can be reported in the text, even if they are not included in the table/graph.

**Class 5 – Projection**
19. The fact that fertility levels affect the age structure more than mortality levels may seem backward, especially given the importance of declining mortality to all of the transitions. Discuss this seeming paradox and show why it makes sense.

20. Analyze the 2015–2100 projections for the countries selected in questions #11 and #15 from the UN Population Division website (World Population Prospects: The 2015 Revision). Develop a report with no more than 300 words, describing and explaining the differences between estimates from a low fertility variant, medium fertility variant, high fertility variant, constant fertility variant, instant-replacement-fertility variant, zero-migration variant, constant-mortality variant, and no change variant.