Section I. Multiple-choice questions (70 points total, 3.5 points each).
Select what you consider is the best answer to each one of the following problems using the “bubble sheet” provided during the test. Only answers written in the bubble sheet will be graded for the multiple choice section of this test.

1. If real GDP doubles over a year it **must** be the case that the actual amount of each and everyone of the goods produced in the economy also doubled
   A. True
   B. False (Example: consider one economy with two goods, apples and bananas. Price of apples=price of bananas=1 at all years. Year one production is 1 each. Thus real GDP year 1=2. Year two production is 0 bananas, 4 apples. Real GDP of year 2 = 4. Thus, real GDP can double and production of some goods can go down.

2. During 2005, the GDP per person of the U.K. equaled £20,411 and the one of the United Status equaled $42,220 U.S. dollars. During 2005 the exchange rate between British pounds and American dollars was £1 = $1.8 U.S. In PPP terms £1 = $1.2 U.S. PPP. The best comparison of purchasing powers of the average U.K. vs. average American citizen is:
   A. During 2005 the average U.K. citizen could buy the equivalent of $24,493 U.S. dollars
   B. During 2005 the average U.K. citizen could buy the equivalent of $36,739 U.S. dollars

Use the following table to answer question 3-5

<table>
<thead>
<tr>
<th>Consumption in Snowville</th>
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<tr>
<td></td>
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<tr>
<td>2002</td>
</tr>
<tr>
<td>Price</td>
</tr>
<tr>
<td>Rutabaga</td>
</tr>
<tr>
<td>Parka</td>
</tr>
<tr>
<td>Book</td>
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</table>
In 2002, consumers in Snowville consumed only rutabagas, parkas, and books. The prices and quantities for 2002 and 2003 are listed in the above table. The reference base period for Snowville's is 2003 (for questions 3-5).

3. The CPI for Snowville in 2002 was
   A. 0.885
   B. 0.895
   C. 1.1172

4. The GDP for Snowville in 2003 was
   A. 400
   B. 440
   C. 452
   D. none of the above

5. The real GDP of Snowville during 2002
   A. Was higher than that of 2003
   B. Was lower than that of 2003
   C. Equal to that of 2003

6. Gross domestic product (GDP) equals the ______ final ______ produced within a country during a given period of time
   A. Cost of producing all; goods and services
   B. market value of all; goods
   C. number of all; goods and services
   D. market value of selected; goods
   E. market value of all; goods and services

7. The average wage for a newly graduated Ph D in Economics for 2005 was $100,000. The US CPI during 2005 equaled 1.0. The US CPI during 2006 is estimated to be 1.05. If the average wage for a newly graduated Ph D in Economics for 2006 is $110,000 then
   A. The real average wage in 2006 is the same as that of 2005.
   B. The real average wage in 2006 is higher than that of 2005
   C. The real average wage in 2006 is lower than that of 2005

8. The full market value of all of the new apartment buildings that will be finished this year in Miami.
   A. will count towards the GDP of 2007, however, only the residential services they provide will count towards the GDP of future years
   B. will count towards the GDP of 2007, and it will also count in full towards the GDP of all future years
9. Which of the following transactions would be included in the GDP of the United States?
   A. Coca Cola produces soft drinks in England.
   B. Honda produces cars in Japan.
   C. McDonalds sells hamburgers in Russia.
   D. Ford Motors produces cars in Mexico.
   E. None of the above.

10. What would have a largest impact on the GDP per worker of the United States? (Assume that the 1/3 rule holds)
    A) An increase of 12% in the stock of capital per worker of the US
    B) An increase of 3.5% in the total factor productivity of the US

11. Growth accounting explains changes in output per worker by
    A) only looking at capital per hour of labor.
    B) only looking at technological change.
    C) using the unemployment rate over time.
    D) measuring capital per hour of labor and total factor productivity.

12. An increase in Total Factor Productivity (TFP) relates to
    A) working harder over time.
    B) working longer over time.
    C) producing the same output with fewer labor hours and more capital.
    D) Producing more output at any given level of productive inputs (capital and labor).
    E) producing the same output with more labor hours.

13. Growth in Total factor productivity is often calculated as the
    A) difference between potential and actual economic growth.
    B) change in output per unit of labor.
    C) growth in output per worker not explained by growth in other production factors.

14. Suppose capital per hour of labor grows at 6.0 percent per year and TFP grows at 1.0 percent per year. Using the one-third rule, the growth rate of real GDP per hour of labor will be ___ percent per year.
    A) 3.0
    B) 1.0
    C) 7.0
    D) 2.0
15. In the above figure showing a productivity curve, suppose a country is initially operating at point a. If the quantity of capital remains unchanged but the economy becomes more efficient it would move to a point such as
   A. point b.
   B. point d.
   C. point c.
   D. point a.

16. Consider an economy that generates its GDP using an aggregate production function that depends only on capital per worker and TFP. Also, assume this function displays diminishing returns in the level of capital per worker. Finally, suppose that the level of total factor productivity is constant through time. According to the Solow model, if total savings are a constant fraction of GDP, and if capital depreciates at a constant rate,
   A. such an economy may experience economic growth
   B. such an economy may experience economic growth but it cannot generate sustained economic growth
   C. such an economy may experience sustained economic growth
   D. Answers A and B are both correct
   E. None of the above answers is correct
17. Consider a researcher that estimates the TFP on an economy with a classical Cobb-Douglas production function that depends only on TFP and capital per worker. (An example of this is function \( GDP_{\text{per worker}} = TFP \times (\text{capital per worker}^{0.34}) \)). Suppose that the true aggregate production function for the economy being considered is indeed Cobb-Douglas, but that the relevant productive inputs are capital per worker, human capital per worker, and TFP. (An example of this is the function \( GDP_{\text{per worker}} = TFP \times (\text{capital per worker})^{0.3} \times (\text{humancapital per worker})^{0.1} \)).

Then,

A. the estimate for TFP based on the classical function will be biased upwards (relative to the estimate that emerges from the true aggregate production function).
B. the researcher using the classical function may conclude that changes in TFP are driving changes in GDP per worker, while in reality human capital changes may be driving GDP with no change in TFP.
C. the estimate for TFP based on the classical function will be biased downwards (relative to the estimate that emerges from the true aggregate production function).
D. both answers, A and B are correct
E. both answers, B and C are correct

18. The following two formulas describe the behavior of capital and GDP for many real-life economies:

\[
K_{t+1} = s \cdot GDP_t + (1 - \delta)K_t
\]
\[
GDP_t = TFP \times K_t^{0.34} \times L_t^{0.66}
\]

Consider the case of Japan during 2007: Their saving rate is 20% percent, their level of total factor productivity (TFP) is equal to 10, their capital depreciates at a 5% annual rate. For this example we also normalize the labor force (L) to equal one. Finally, \( K_{2007} = 267.5246 \). According to the Solow model, the capital stock of this economy for 2008 will be

A. Approximately the same as that of 2007
B. Substantially more than in 2007
C. Substantially less than in 2007

19. (continues from question 18) According to Hayashi and Prescott, the TFP of Japan has remained roughly constant during the last decade. Assume that the parameters described in question 18 as well as TFP remain constant from 2007 to 2010. Based on your analysis in question 18, the forecasted growth rate for the GDP of Japan from 2007 to 2010 will be

A. Quite substantial, in spite of the stagnant TFP
B. Quite negative
C. Close to zero. Hence, this simple model can also explain the recent stagnation of Japan.
20. According to the data discussed in class, and reported by Lucas, the GDP per capita (in comparable purchasing power units) of the richest countries is about _____ times that of the poorest countries.
   A. 2 to 4
   B. 10
   C. 30 to 40
Section II. Short essays (33 points total, including 3 points of extra credit).  
Use the space provided below to answer the following questions (I will not grade anything outside the provided space). Be as concise as possible.

1. (12 points) The following two questions are based on the assigned readings by Lucas and Prescott.
   i. (6 points) How does Robert E. Lucas Jr. define the problem of economic development in his paper "On the mechanics of economic development"?

   The problem of accounting for the observed pattern, across countries and across time, in levels and rates of growth of per capita income.

   ii. (6 points) What is the main factor driving the observed differences in incomes across countries according to Edward C. Prescott in his paper “Needed: A theory of total factor productivity.” In particular, what is the role of (and what are the interactions between) capital per worker and total factor productivity in accounting for the observed differences in incomes?

   Differences in total factor productivity are the main force driving the observed differences in incomes across countries.

   Differences in capital per worker are also important, but rich countries have a higher capital per worker because they also have a higher total factor productivity.
2. (15 points total) The economy of Argentina was submerged in a great depression that began around 1998 and deepened after mid 2001 with average quarterly falls of GDP per capita of 5% that lasted until 2002. According to various researchers at the Inter-American Development Bank (IADB), and at the World Bank, fixing the value of the Argentine peso to the U.S. dollar resulted in an "overvaluation" of the peso. Overvaluation made the Convertibility Plan unsustainable, and the inevitable collapse of the plan produced the current crisis. The collapse of Argentina's fixed exchange rate resulted in an unexpected, severe, and prolonged stop in capital flows to Argentina. In summary, some researchers at the IADB, and at the World Bank, argued that the great depression of Argentina was due to a slow down in the growth of capital per worker.

Assume that GDP in Argentina can be related to the factors of production according to the formula

\[ GDP_t = A_t K_t^\alpha L_t^{1-\alpha}, \]

where \( A \) is the level of total factor productivity, \( K \) denotes the stock of capital and \( L \) is the number of employed workers in the economy. Finally, \( \alpha \) is a number (think of it as 0.34). The following table provides you with a growth accounting decomposition of Argentina's per-capita GDP. (in the table below the column titles “due to” indicate changes in productive factors have been already adjusted to reflect implied changes in output – e.g. the one third, and similar, rules have been already applied for you)

<table>
<thead>
<tr>
<th>change in per capita GDP (1998-2002)</th>
<th>due to TFP</th>
<th>due to capital</th>
<th>due to labor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990-1996: 3.90</td>
<td>6.11</td>
<td>-1.76</td>
<td>-0.45</td>
</tr>
<tr>
<td>1998-2001: -6.64</td>
<td>-5.95</td>
<td>2.91</td>
<td>-3.60</td>
</tr>
</tbody>
</table>

A) (10 points) According to the above table, what accounts for most of the dramatic decline in GDP per capita of Argentina? Explain

The most important factor is the decline in TFP. TFP growth during 90-96 was pushing GDP up by a 6.11% per year. By 98-01 TFP was pushing GDP down by -5.95%. A total decline of almost 12%!

Labor declines were also important since they account for a total decline of 3.15% in per capita GDP (during 90-96 changes in labor accounted for a decline in GDP per capita of 0.45% while during 98-01 changes in labor accounted for a decline in GDP per capita of 3.6%, a total decline in GDP growth of 3.15%)

B) (5 points) Is the explanation proposed by the researchers from the Inter-American Development Bank and from the World Bank consistent with the above data? Explain

No, as a matter of fact capital accounted for positive growth during 98-01.