Define 3 of the following concepts:

(i) Post-Malthusian regime

(ii) Standing on shoulders

(iii) Poverty trap

(iv) Growth effect versus level effect

(v) Human capital
II (3.5 val)

In the following questions, choose the only correct answer. Answering correctly yields 0.7 points, wrongly -0.175.

1. According to the Kremer theory, by the xv century population density was higher in Eurasian than in Australia because:
   a. Eurasia started out with more population.
   b. Technological progress depends on the population size;
   c. In the centuries before, technology could not diffuse across these two regions;
   d. All the above.

2. According to the theories of demographic transition, the declining fertility rates that come along with economic development are related to:
   a. A lower asset role for children.
   b. Higher demand for education;
   c. The participation of women in the labour force;
   d. The fall in death rates.
   e. All the above.

3. In light of the Solow model
   a. Poor countries should grow faster than rich countries
   b. Rich countries should grow faster than poor countries;
   c. Similar countries should converge in absolute terms;
   d. None of the above;

4. In light of the AK model:
   a. Poor countries should grow faster than rich countries
   b. Similar countries should reach the same level of per capita income in the long run;
   c. Similar countries should growth at the same rate;
   d. None of the above.

5. If technology diffused perfectly across the world:
   a. Poor countries should have higher interest rates than rich countries.
   b. Interest rates could be the same in rich and in poor countries if endowments of human capital differed;
   c. Nobody would devote purposeful efforts to produce technology;
   d. All the above.
II (12 points)

In the following exercises, (a) and (c) are mandatory. As for the remaining, choose two.

II.1. Consider a traditional economy devoted to agriculture, where aggregate production can be described by \( Y_t = BT^{0.5}N_t^{0.5} \). The amount of land available is \( T=1 \), and \( B=5 \). The population dynamics can be described by the following equation:

\[
N_t - N_{t-1} = 100\left[\bar{y}_{t-1} - \bar{y}\right]
\]

where \( \bar{y} = 1 \) is subsidence per capita income.

a) (a1) Find out the steady state in this economy, \( (N^*, y^*) \). Departing from this steady state, suppose that at moment \( t=1 \), some swamps were drained, so that arable land expanded by 10.25%. (a2) How much would be per capita income in that year? (a3) And population in year \( t=2 \)? (a4) If nothing else changed, what would happen to per capita income over time? Explain, with the help of a graph. (a5) In the long run, would population density have changed relative to the initial one?

b) Assume that, instead of exogenous, technology was a function of last year’s population \( B_t = 0.2N_{t-1} \). (b1) Explain the intuition; (b2) Explain what would happen to technology, per capita income and population in the years that followed the swamp drainage. (b3) Which real world facts is the model intending to capture?

II.2. Consider an economy \( (W) \) where the aggregate production function is given by \( Y_t = A_tK_t^{1/2}N_t^{1/2} \). In this economy, the saving rate is 20%, capital depreciates at 5% per year, and population is constant and equal to \( N=100 \).

c) Assume that \( A_t = 1 \). (Find out the steady state values for: (c1) per capita income; (c2) interest rate; (c3) capital and labor income shares; (c4) wage rate. (c5) To what extent does this model comply with the Kaldor stylized facts? (c6) Represent the equilibrium in a graph and discuss its stability.

d) Sticking with \( A_t = 1 \), analyze graphically and quantify, when possible, the short term and long term effects of an increase in the saving rate to \( s=25\% \) on: (d1) per capita income; (d2) per capita consumption; (d3) the interest rate. In light of your findings, would the saving rate be a good candidate to explain: (b4) why some countries are much richer than others? (b5) long term growth?

e) Departing from \( s=20\% \), and \( A_t = 1 \), analyze graphically and quantify, when possible, the implications of an increase in \( A_t \) to \( A_t = 1.2 \), namely on: (b1) per capita income; (b2) the interest rate. On the basis of your findings, could \( A \) be a good candidate to explain: (c3) why some countries are much richer than others? (c4) long term growth? (c5) What would be the driving forces behind \( A \)?

f) Departing from (c), assume instead that \( A_t = h^{0.5} \). (f1) Will the implied production function have the neo-classical properties? Why? Assume that human capital accumulated according to \( \dot{h} = 0.018y - 0.05h \). (f2) Explain this equation. (f4) Assuming again a saving rate on physical capital equal to 20% and a depreciation rate for physical capital equal to 5%, what would be the growth rate of this economy in the long run? (f4) Explain, with the help of a graph.