Guidelines for Marking
ECON4620 - Public Economics I

Solution 1:
a) Distortionary tax: A tax is distortionary when it causes a violation of the first best conditions for allocative efficiency (equal marginal rates of substitution, equal marginal technical rates of substitution, equality of marginal rates of substitution and transformation). There are a lot of different scenarios that can be discussed (e.g. tax on labor income, tax system with reduced VAT, dividend taxes). It is necessary to describe the tax system the scenario is based on as well as the implied distortion(s) (e.g., labor-leisure choice, intertemporal allocation, investment decision, source of financing an investment) and their cause(s).

This question captures a fundamental and relatively easy point several times mentioned in the lecture. As we have discussed possible applications in the lecture students have the possibility to choose a topic they like.

b) Lump sum taxes that differentiate between people based on specific characteristics are often not available due to market failures (e.g. asymmetric information). Lump sum taxes that are equal for everybody may be possible but one has to keep into mind that some people will not be able to pay them. Moreover, such a tax does not help if redistribution is part of the objective.

Solution 2:
a) Behavioral effects (i.e., changes in labor supply, tax evasion etc.) implying efficiency losses and redistribution effects should be mentioned. It would also be nice if the equity-efficiency trade-off is mentioned. Based on Brewer et al. (2010) students may base their discussion on the distinction between (i) mechanical effect (direct effect, i.e., increase in tax revenue), (ii) welfare effect (capturing an increase in welfare due to redistribution), and (iii) behavioral effect (change in taxable income due to change in labor supply, tax evasion etc.). It is, however, not necessary that this specific "wording" is used.

b) The students should mention that the tax rate decreases in g, ε and a. It should be explained that g captures the redistribution effect and that the tax rate is the lower the more the consumption of the top earners is valued. It should also be mentioned that ε captures the behavioral effect. The more elastic income responses are the more pronounced is the negative behavioral effect and, therefore, the lower the optimal tax rate. Good students may also interpret the effect of a. With $a = 1$ everyone is a top earner (and with g=1) the standard Laffer curve result follows. If there is just a single top earner ($a \to \infty$) the tax rate converges to zero illustrating the "no distortion at the top" result by Mirrlees.

Solution 3:
a) Investor maximizes net income generated by investing in the corporation taking the opportunity costs of the investment, i.e. *iK*, into account. In the first-best scenario he maximizes
$$f(K) - iK$$
which gives optimal investment
$$f' = i$$

Optimal investment implies equality of marginal benefit of investment and marginal costs.

Based on the described tax system the objective of the investor reads

$$(1 - t_p)(1 - t_c)f(K) - (1 - t_p)iK.$$

In addition to the corporate tax there is a personal tax on capital income.

First-order condition:

$$f' = \frac{1}{1-t_c}i > i$$

The corporate tax increases the user costs of capital. Investment is downward distorted. The tax on personal income does not affect the investment decision.

b) With ACE the corporate tax base reads $f(K) - iK$ (where K denotes equity). The personal tax applies to the return after corporate taxation, i.e., to $f(K) - t_c[f(K) - iK]$. The optimal investment is given by

$$f'(K) - t_c[f'(K) - i] - t_p[f'(K) - t_c(f'(K) - i)] = (1 - t_p)i$$

and therefore

$$f' = i$$

The tax system becomes neutral with respect to the investment decision which is an advantage. Moreover, ACE leads to neutrality with respect to the financing decision (equity versus debt). Introducing ACE, however, reduces the tax revenue. A revenue - neutral reform may imply an increase in the corporate tax rate which increases the average tax rate. This tax increase affects the investment decision (especially where to locate a project at all). Internationally mobile capital may be invested abroad. An introduction of ACE may, therefore, only be beneficial if introduced coordinated in all countries. A discussion of he ACE proposal is given in De Mooij & Devereux (2011).

Solution 4:
a) The term gives the marginal rate of substitution between private and public consumption. It describes with how many units of private goods the individual must be compensated for a unit decrease in public consumption.

b) Optimal provision of public goods requires (according to the Samuelson rule) that the sum of marginal rates of substitutions over all individuals equals the marginal rate of transformation. An extra unit of the public good benefits each individual. An extra unit of the private good just benefits the individual consuming the extra unit of the private good.

c) The Samuelson rule holds if the public good is financed by lump sum taxes. It is not obvious whether it is valid or not when distortionary taxes are used. When distortions exist, the crucial question is whether additional funding and supply of the public good exacerbate or mitigate the preexisting distortions. This can take the form of behavioural changes in tax revenue or tightening or relaxation of self-selection constraints on the design of tax policy. A more subtle point is that an aggravation of the distortion may be offset by a beneficial distributional effect. (Cf. the Slemrod & Yittzaki paper).

In this part the students have the possibility to elaborate. Some points discussed in the lecture are listed below. The students do not have to capture all of them.

Atkinson & Stiglitz (1980) derive the following optimality constraint

$$\frac{HU_G}{a} = \frac{1}{a}p_G - \frac{1}{a}tH\frac{\partial X}{\partial G}$$

When tax funding causes additional inefficiencies there is an additional social cost. This point is captured by the fact that the resource cost are multiplied with $\frac{1}{a}$. Moreover the public good provision may trigger further behavioral responses captured by the last term.

Boadway & Keen (1993) show that with a nonlinear income tax efficient provision of public goods can be characterized by

$$\sum MRSi_{GX}^h = p + \frac{1\hat{V}_X^2}{g}1^*\left[M\hat{R}S_{GX}^2 - MRS_{GX}^1\right]$$

Whenever the high- and low-ability type differ in their marginal evaluation for the public good the Samuelson rule is violated.

Edwards et al. (1994) show that with commodity and income taxation efficient provision of public goods is characterized by

$$\sum_{h=1}^{2}n_h MRS_{GB}^h = r + 1^*\{M\hat{R}S_{GB}^2 - MRS_{GB}^1\} - \sum_{h=1}^{2}n_h\sum_i t_i\frac{\partial x_i^h}{\partial G}$$

This result deviates from the Samuelson rule by the last two terms. One, i.e. $1^*\{M\hat{R}S_{GB}^2 - MRS_{GB}^1\}$, captures marginal valuations of the public good for the high- and low-ability type respectively. The other, i.e., $-\sum_{h=1}^{2}n_h\sum_i t_i\frac{\partial x_i^h}{\partial G}$, captures the effects of increases in the level of public good provision on commodity tax revenue that occur through changes in compensated (conditional) commodity demand.