Final Exam
Economics 136 – Human Resources
Spring 2000
Prof. Julian Betts

Name: _____

Student ID _____

There are 9 written problems in this exam, worth a total of 100 points. Please write neatly. If you place the answer to a question in an odd place, such as the back of the page, please indicate this clearly, for the sake of the marker.

      If you use pencil, the exam cannot be regraded.

      SHOW ALL YOUR WORK, AND WRITE YOUR ANSWERS IN A WAY THAT THE GRADERS SHOULD BE ABLE TO UNDERSTAND!

      You have 180 minutes to complete this exam. Good luck.

1) (4 points) For the following, circle the correct answer **and explain why it is correct** in a few sentences.

The value marginal product of a worker who is employed in a price-taking profit-maximizing firm is equal to:

a) Zero

b) The value of her output plus the rental cost of capital used for her job

c) Her wage

d) Rental cost of capital used for her job.

2) (4 points) For the following, circle the correct answer (a, b, c, or d) and explain why it is correct in a few sentences.

Screening new workers is an expensive process. It is not unusual for costs involved in hiring a professional to reach as much as 50% of her annual salary. By increasing the time and resources involved in interviewing a prospective candidate, a firm can get a more accurate signal regarding her ability. Which of the following are likely to result in increased expenditures on screening each prospective employee?

I. A new government regulation that makes it more difficult to fire workers
II. An industry-wide wage increase
III. An increase in the rental cost of capital employed by a firm

a. I
b. I and II
c. I and III
d. II and III

3) (20 points) A worker produces shirts. The worker prefers to work at an easy pace, producing fewer shirts per hour, if his compensation is not affected. Suppose that the worker views his "cost" per hour of producing shirts as given by:

$$C = aS^2$$

where S is the number of shirts produced per hour, so that the "pain" induced in producing one shirt per hour is $a. That is, the worker would not be willing to come to

work and produce one shirt per hour for less than $a per hour. If the worker were required to produce two shirts per hour, this requires so much extra effort that the worker would only be willing to do this for at least $4a, and so forth

As a manager, you want to raise output of shirts and lower minimum cost. This requires that you take into account the behavior of workers. Two methods are considered, a piece rate and a straight salary.

A. Pay workers a piece rate, i.e. a certain amount W per shirt, plus a signing bonus or penalty of K. A shirt sells for $20a and there are no other costs of shirt production. (We ignore the cost of materials to avoid further complications.)

a) (5 points) For a given K and W, how many shirts per hour will the worker produce?

b) (3 points) Given your answer to a), what is the optimal piece rate paid per shirt produced?

c) (1 point) How many shirts does each worker produce per hour?

d) (1 point) What is the level of profit per worker per hour?

B. Require a certain number of shirts per hour and to pay an hourly wage rate. All who do not meet the requirement are terminated.

a) (7 points) How many shirts would be required and at what wage? (Hint: The worker's choice is simple: she accepts the hourly wage and produces exactly the number of shirts requested, or quits.)

b) (1 point) What are profits per worker per hour?

c) (2 points) In a sentence or two, what happens if you require more shirts per hour from this worker at that wage?

4) (8 points) Suppose that your firm has two divisions, and that you know the productivity of your workers in each of these two divisions, perhaps through rotating people between divisions over time.

State the 'rule of absolute advantage' for allocating workers to the two divisions, and state clearly the type of situation in which this rule should be applied.

5) (6 points) Suppose that your firm has two applicants for a job at your firm. They have the same expected productivity on the job, with each expected to bring in net revenues of $80000 per year. But applicant B's output is much more uncertain than applicant A's output, which is $80000 with certainty. Discuss whom your firm should hire, and in which circumstances.

6) (20 points) Suppose that V(t) and W(t) give the value marginal product and the wages that will be paid to a worker at age t, where t varies between 30 and 65 (the retirement age). Define R(t) as the present discounted value of the sum of V(t)-W(t) from age t to age 65.

Suppose that much of the training that the firm provides is firm-specific human capital.

a) (4 points) Explain in a sentence or two why the firm will generally offer to subsidize the costs of such training for young workers, while regaining the cost of the subsidy in later years by paying workers below their productivity, and why the workers like this.

b) (4 points) Draw the typical sorts of profiles that we would expect to see for V(t) and W(t) in this situation, in a graph of V and W against worker age.

c) (4 points) Draw a graph of R(t) against age t, and write a few sentences to explain why the line has the shape and position that you illustrate.

d) (3 points) Now suppose that a price war erupts in the firm's industry, reducing the selling price of the firm's product. Redraw the graphs from b) and c) for such a situation, showing the original lines in solid, and the new lines as dotted lines. Be sure to label each line.

e) (3 points) From this finding, what age range(s) of workers should be laid off (young, middle-aged, old)?

f) (2 points) Give two reasons why buyouts instead of layoffs may be the best way of handling layoffs for workers who are not "young".

7) (20 points) You are trying to set up the salary scale at your firm where there are two levels of jobs, workers and bosses. All individuals at the firm produce the same thing, frisbees, which sell for $12 each, are which are produced as follows:

$$q = m + e$$

where q is the number of frisbees produced per period, m is effort, and e is a luck factor over which the worker has no control.

There are two workers, j and k. Each worker experiences luck, e_j and e_k, respectively. $x = e_k - e_j$ takes on values between -½ and ½ with a uniform probability distribution. Each worker maximizes the utility function
$$W_i - (m_i)^3$$
where Wi is the wage paid at the end of the tournament (nothing is paid before) and the m_i^3 term measures the cost of effort expended to the worker, for i=k,j.

a) (10 points) Given some wages W_1 and W_2 that will be paid to the winner and loser of the tournament, with $W_1 > W_2$ and the winner receiving W_1, work out an equation which links the wages to the level of effort supplied by the worker.

b) (10 points) Assume that the firm knows your answer to a). Calculate the optimal (profit-maximizing) wage gap W1- W2 that the firm should set, and the actual optimal wages W_1 and W_2. Assume that to attract the workers to the firm, the firm must set the expected utility of the worker to at least 0. What are the profits that result?

8) (14 points)
a) (8 points) Suppose that there are two types of workers, of HI and LO ability. Worker utility = wages – cost(education) where the function cost(education) indicates the cost of education. Assume that for a given level of education, cost(education) is higher for the LO ability workers. Use this set-up to explain the theory of education as a signal. State any additional assumptions you make clearly.

b) (6 points) Summarize in a few sentences the evidence gathered by Wolpin, Weiss and Altonji on whether education acts as a signal of ability instead of providing additional human capital to workers.

9) (4 points) List the two conditions under which it might make sense for a firm to have a policy of not matching outside job offers that its employees might receive. Then explain in a sentence or two why such a policy would work to the firm's advantage given the two conditions.