DIRECTIONS.

The exam contains a mix of short answer and essay questions. Your answers to the 21 short answer portion of the exam (3 points each unless indicated otherwise) should be listed on the answer sheet attached to the end of the exam. Your answers to the essays should be provided in the blue book provided. Upon completion of your exam, insert the answer sheet for the short answer questions inside of your blue book.
Consider the following data for August 2002 to answer the questions that follow (all numbers are in 1000s).

Civilian noninstitutional population 212,135
   Civilian labor force 141,862
   Employed 134,905
   Not in labor force 70,274

1. What is the labor force participation rate?
2. What is the unemployment rate?
3. If 1 million people who were previously unemployed leave the labor force, what will the new unemployment rate be?
4. An October newsletter from Vanguard Investments revealed that “The nation's unemployment rate dipped to 5.6% in September from 5.7% a month earlier. Employers eliminated a total of 43,000 jobs during the month.” In one sentence, explain how it is possible for the unemployment rate to drop at the same time that the number of people employed falls.
5. According to data provided by monster.com, a $50,000 salary in Cincinnati, OH is equivalent to a $22,900 salary in Vermillion, SD. Based on this information, how much higher is the cost of living in Cincinnati than Vermillion?

Consider the information below to answer the following 2 questions.

<table>
<thead>
<tr>
<th></th>
<th>September 2001</th>
<th>September 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Wage Rate</td>
<td>14.43</td>
<td>14.87</td>
</tr>
<tr>
<td>Real Wage Rate (1982 dollars)</td>
<td>8.01</td>
<td>8.14</td>
</tr>
<tr>
<td>CPI</td>
<td></td>
<td></td>
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</tbody>
</table>

6. Given that the CPI is used to calculate real wages, how much higher (in percentage terms) are prices in September 2002 than in 1982?
7. Given that the CPI is used to calculate real wages, what was the inflation rate between September 2001 and September 2002?
The output of workers at a factory depends on the number of supervisors hired (see below). The factory sells its output for $.50 each, it hires 40 production workers at a wage of $200 per day, and needs to decide how many supervisors to hire. The daily wage of supervisors is $500 but output rises as more supervisors are hired, as shown below.

<table>
<thead>
<tr>
<th>No. of supervisors</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output per day</td>
<td>1,500</td>
<td>2,600</td>
<td>3,300</td>
<td>3,900</td>
<td>4,400</td>
<td>4,600</td>
</tr>
</tbody>
</table>

8. What is the marginal product of the fourth supervisor? ___________

9. What is the marginal revenue product of the fourth supervisor? ___________

10. How many supervisors should the firm hire to maximize profits? ___________

To answer the next 3 questions, suppose that the labor supply curve for life-guards is \( L^s = 50 + 10W \) and the labor demand curve is \( L^d = 200 - 5W \) where \( W \) is the hourly wage rate and \( L \) represents the number of lifeguards.

11. What is the equilibrium wage rate?

12. What is the equilibrium level of employment?

13. Suppose that the government decides to subsidize the employers of life-guards by $2 per hour. For any given wage rate received by the employee, the employer would then pay \( (W-2) \) of the cost. What will the equilibrium wage rate be after this subsidy is offered?

14. Other things being the same, the $2 subsidy will increase life-guard employment more if labor demand is more (elastic, inelastic) or labor supply is more (elastic, inelastic).
   a. elastic; elastic.  b. elastic; inelastic.  c. inelastic; elastic.  d. inelastic; inelastic.
15. Suppose that a union negotiates a 10 percent increase in the hourly wage for its workers and the employer responds by cutting employment by 8 percent. The wage-elasticity of demand for labor is _____ (provide a number rounded to the nearest one-tenth).

16. If a person works less when her wage rate FALLS, it would be correct to conclude that the income effect of the wage cut was (greater than, less than) the substitution effect.
   a. greater than
   b. less than

17. Suppose that the wage rate paid to lawyers increases. The demand for paralegals would increase if lawyers and paralegals were
   a. gross substitutes  b. gross complements.  c. net substitutes  d. net complements.

18. When the wage rate paid to lawyers increases, the scale effect would (increase, decrease) the demand for paralegals and the substitution effect would (increase, decrease) the demand for paralegals.
   a. increase; increase.  b. increase; decrease.  c. decrease; increase.  d. decrease; decrease.

19. An increase in quasi-fixed labor costs will lead a firm to (increase, decrease) hours per worker and (increase; decrease) number of workers.
   a. increase; increase.  b. increase; decrease.  c. decrease; increase.  d. decrease; decrease.

To answer the next two questions, suppose that a firm that manufactures athletic shoes pays a wage of $200 per day, a unit of capital costs $600 per day, the marginal product of a worker is 40 shoes, the marginal product of capital is 100 shoes, and the price of a pair of shoes is $10.

20. If the firm wants to hold shoe production constant, should it use more labor and less capital, or less labor and more capital?
   a. more labor ; less capital  b. less labor; more capital.

21. If the firm hired one more worker, its profits would (increase, decrease) by $______.
ANSWER TWO OF THE NEXT THREE QUESTIONS.
(If you answer all 3, I'll grade the first two.)

1. (8 points) Suppose that the federal government decides to increase the Social Security payroll tax to improve the financial status of the program. Explain how the employment effect of this payroll tax hike on employment in a given industry would depend upon
   a. labor’s share of total cost.
   b. the elasticity of demand for the industry’s product.

   Use your knowledge of “scale” and/or “substitution” effects to explain why these factors would affect the size of the employment effects.

   a. As labor’s share of total cost increases, the employment effect of the payroll tax increase would grow. If labor's share of total cost is greater, an increase in the payroll tax leads to a larger decrease in product supply since costs will increase by a larger amount. The larger decrease in product supply will lead to a larger decrease in the equilibrium quantity of the product, and larger negative scale effect on the employment of labor.

   b. As the demand for the product becomes more elastic, the leftward shift in the product supply curve caused by the payroll tax increase will lead to a greater decrease in the equilibrium quantity of the product. This leads to a larger negative scale effect on the employment of labor.

2. (8 points) During class, we discussed the financing of health benefits for black lung disease with either a sales tax or payroll tax.

   a. With reference to scale and/or substitution effects, explain why coal miners preferred the sales tax method of finance.

   The sales tax on coal will shift the coal supply curve leftward (assuming the tax is levied on the producer) and decrease the equilibrium quantity of coal sold. This yields a negative scale effect. A payroll tax on coal workers would also decrease coal supply and create a scale effect. In addition, the payroll tax would increase the cost of labor relative to capital, leading to a substitution effect that further reduces the demand for coal workers. Consequently, the payroll tax will have a larger negative effect on labor demand than the sales tax.

   b. We also pointed out that surface miners would have been hurt less by the payroll tax than the underground miners. With reference to scale and/or substitution effects, explain why this would be the case.

   Surface mining is less labor intensive than underground mining. As a consequence, a payroll tax would have a smaller effect on the cost of production for surface mining and a smaller negative effect on coal supply. This, in turn, means that the scale effect of the payroll tax on labor demand would be smaller for surface miners.
3a. (4 points) For decades, most employers bought group health insurance from insurers who charged premiums on a per-worker basis. In 1993, a proposal for a national health insurance plan contained a provision requiring group health insurers to charge premiums through a payroll tax (i.e. a fixed percentage of the employer's payroll). Assuming the total premiums paid by employers stay the same, how will employers adjust in terms of hours per worker vs. the number of workers. Explain the rationale behind your answer.

The shift from a per-worker premium to a payroll tax would convert the health insurance premium from a quasi-fixed cost to a variable cost. Using the notation developed in class, if the firm was initially using a mix of hours per worker (H) and workers (N) that minimized cost, they would have \( \frac{\text{MEn}}{\text{MPn}} = \frac{\text{MEh}}{\text{MPh}} \), where ME represents marginal expense and MP is marginal product. The shift from a quasi-fixed cost to a variable cost would lead to \( \frac{\text{MEn}}{\text{MPn}} < \frac{\text{MEh}}{\text{MPh}} \) because the reduction in quasi-fixed costs and increase in variable costs will drive MEn down relative to MEh. To return to a cost minimizing mix of N and H, the firm would increase the number of workers and decrease the number of hours per worker.

3b. (4 points) Professor Even is currently working on a study of "phased retirement". In the study, he finds that less than one-fourth of employers would be willing to allow their employees to switch to "half-time" work. Given what we learned about factors influencing employer decisions on hours per week versus number of employees, what could explain employer reluctance to allow part-time work?

Employers are reluctant to allow part-time work if there are large quasi-fixed costs. When there are quasi-fixed costs, if part-time and full-time workers are paid the same hourly wage, two half-time workers would cost more than one full-time worker. Consequently, the firm would be reluctant to allow a worker to go to half-time unless he or she was willing to take a sufficiently large cut in the hourly wage to accommodate the increase in the hourly cost of the quasi-fixed cost.
4. (15 points) Suppose that workers can go to firms without training and earn $40,000 per year for the remainder of their work life (suppose that is 20 years). Assume a zero interest rate. Further, suppose that YUKON (a fictional employer) provides firm specific training at a cost of $20,000 in the first year and the worker produces nothing during that first year. The training will increase the worker's productivity to $42,000 in years 2-10.

a. If Yukon pays workers $40,000 per year for 10 years and can force workers to stay for the 10 years, should it hire and train more or less workers? Why?

In this example, \( PVP = 42,000 \times 9 = 378,000 \). \( PVC = 20,000 + (10 \times 40,000) = 420,000 \). Since the present value of the worker's production is $42,000 less than the present value of the cost of the worker, the firm should hire and train fewer workers.

b. If Yukon cannot force workers to stay for the 10 years, how could it structure pay to increase the chance that the worker will stay?

Yukon could cut the workers pay in the first year and increase the worker's pay in subsequent years. It would still want to remain competitive with the other firms over the worker's career (i.e. offer $400,000 over 10 years), but by paying more than $40,000 in the later years, it reduces the chance that the worker will leave.

c. Give two reasons that employees might be reluctant to accept the kind of pay system described in b?

Workers might be reluctant to accept the deferred pay system because (i) the firm might go bankrupt; or (ii) the firm might not live up to its agreement to increase pay above $40,000 in later years. If either occurs, the worker will receive less than they would have if they had accepted the $40,000 per year job with the competing employer.

d. If the training provided by Yukon was general instead of firm specific, how much could Yukon pay the worker in period 1 if it is to break even on the worker and can't force the worker to stay? Explain.

If the training is general, Yukon will have to pay the worker $42,000 per year after the training in order to prevent the worker from switching to another employer that would pay the worker his marginal product. Consequently, since the worker produces on $420,000 over the 10 year career, the firm cannot pay the worker anything in period 1 and in fact, must charge the worker $20,000 for the training that the firm provides. That is, the worker will have to pay the firm for the cost of the general training.
5. (20 points) One part of the Ohio welfare system is called “Ohio Works First”. The program provides cash assistance for families depending on the number of dependents in the family and the family’s earnings. For example, a single mother with two children is eligible for cash assistance if her earnings are at or below $630. If eligible for benefits, she will receive $630 minus an adjustment factor that equals one-half of any labor earnings above the exemption of $250 per month. For example, a woman who earns $250 or less will be entitled to a monthly benefit of $630. A woman who earns $500 per month would receive $630-$125=$505. A woman earning more than $630, however, is not eligible for benefits.

To illustrate the effect of this program, consider the budget constraint drawn below for Mary. The budget constraint is drawn to reflect her job opportunities with no welfare program.

![Budget Constraint Diagram](image)

a. Based on the budget constraint, what is Mary’s wage rate? $5

b. On top of the above diagram, draw the budget constraint created by the introduction of the OWF program. For full credit, you should label the hours and income levels associated with any “critical points” on the budget constraint. Be sure that you label the new budget constraint so that it is easy to identify.

The budget constraint created by the OWF program is ABCDE. At 354 hours of leisure their person would be at C. Anywhere less than 354 hours of leisure, the worker would be on DE.

c. Based on the diagram you drew, what range of hours would NOT be chosen by Mary if she has the opportunity to draw OWF benefits? Provide a brief explanation for your answer.

Mary would not work between 126 and 214 hours per month. The reason is that she could work between 126 hours per month (point C) and have a greater total income than she would receive for working in that range. That is, Mary would prefer more money for less work (point C is preferred to any point on DF).

d. Suppose that Mary was earning $200 per month on a part-time job and collecting OWF benefits. If the OWF eliminated the earnings exemption of $250, is she likely to respond by working more or less hours? Explain by describing the direction of both the income and substitution effect of this change.

If Mary was earning $200 per month and the exemption was eliminated, her OWF payment would be cut by $100 and the marginal reward for extra work would be $2.50 per hour instead of $5.00 per hour. The income effect of the lost income would cause Mary to work more. The substitution effect of the reduced marginal reward for additional work would cause Mary to work less. The net effect is ambiguous.
More than 43,000 unemployed workers would have to quit searching for work and leave the labor force. [explanation: The unemployment rate \( \frac{u}{(U+E)} \) where \( U \) is the number unemployed and \( E \) is the number employed. If 43,000 workers lose their jobs and leave the labor force, \( U \) would be unchanged and \( E \) would drop 43,000, pushing the unemployment rate upwards. However, if the number of unemployed also shrinks, \( U \) decreases and that causes the unemployment rate to drop.]