Jadavpur University
M.A Entrance Test, 2017
Subject: Economics

Full marks 100   **Time 2 and half hours**

INSTRUCTIONS
1. Mark the correct choice by filling the corresponding circle by blue/black ink pen (as in the sample answer)
2. All rough works must be done on the blank pages attached at the end.

SAMPLE ANSWER

1) Consider a multi plant firm which wants to produce an output Q by using both its plants, each of which faces a total variable cost curve which is upward sloping and convex to the origin. Which rule will determine the cost minimizing allocation of Q between the two plants?

(i)   Equality of marginal costs   ●

(ii)   Equality of total variable costs   ○

(iii)   Equality of total (variable +fixed) costs   ○

(iv)   None of the above   ○

Section A: Micro Economics

2x13= 26

1. If due to rise in tax on wage income an individual's labor supply falls it must be the case that in the preference of the individual:

    (i) Income effect dominates substitution effect   O

    (ii) Substitution effect dominates income effect   O

    (iii) Income effect is exactly same as the substitution effect   O

2. The size of population commuting from City A to B is 1. There are two possible alternative modes of commuting: either by using personal car or by using train. Commuting by train takes 70 minutes. Commuting by car takes $C(x) = 20 + 60x$ minutes, where x is the proportion of commuters taking cars. What is the proportion of commuters who will take car if everyone is taking her decision freely and independently so as to minimize her own commuting time?

    (i)   1/3   O

    (ii)   1   O

(iii) 5/6   O

(iv) 0   O

3. Suppose that X is manufactured using a raw material B that is available from a location called "mine". Production of 1 ton of X requires 1/3 of a ton of B. A firm called X Enterprises, which has a contract to deliver 30 tons of X to a location called "market", is trying to decide where to locate its plant. The mine and the market are 50 miles apart. Overland shipments of both X and B costs $2 per ton per mile shipped. However additional costs must be incurred because a river passes between the mine and the market, and the river has no bridge. Goods must be loaded onto barges to cross the river, which is located 16 miles from the mine. Barge operator charges $1 per ton of X shipped across the river. However, since the input B is highly toxic when mixed with water, barge operators must charge an extremely high price to transport B across the river. The price reflects the cost of insurance that the operators must carry to meet liability claims should they accidentally pollute the river with their cargo. The cost of shipping one ton of B across the river is $195. What should be the transport cost minimizing location for X enterprise? (Assume that the width of the river is negligible, so that it can be ignored)

    (i) At the market   O

    (ii)   At the mine   O

    (iii)   On the mine-side of the river   O

    (iv)   On the market-side of the river   O

4. In question 3 above suppose a bridge were built across the river, what would have been the location of X enterprise?

    (i)At the market   O

    (ii) At the mine   O

    (iii) On the mine-side of the river   O

    (iv) On the market-side of the river   O

5. Consider a two commodity world where the commodities are apples which you like and pollution which you dislike. What will your indifference curves between apples and pollution look like?
    (i)Vertical lines with an infinite slope   O
    (ii)Horizontal lines with a slope of zero   O
    (iii) Downward sloping   O
    (iv) Upward sloping   O
    (v)   None of the above.   O

6. Consider a utility function of the form $U = x^2y^4$ where x is the amount consumed of commodity X and y is the amount consumed of commodity Y and both have positive prices. Utility maximisation subject to the full expenditure of the given income, M, would imply that the share of M spent on X is

    (i) 1/2   O

    (ii) 1/3   O

    (iii) 1/6   O

    (iv)2/3   O

    (v) 0   O

7. When will profits as a function of quantity consumed definitely not be in the "shape of an inverted U with a peak at a positive level of profit"? Assume zero fixed costs.

(i)The marginal revenue curve is downward sloping and intersects the flat marginal cost curve (slope of zero) from above	O
(ii) Marginal revenue and marginal cost are constants, independent of quantity.	O
(iii) Marginal revenue curve is downward sloping and intersects the upward sloping marginal cost curve from above.	O
(iv) Both marginal revenue and marginal cost curves are downward sloping but the marginal revenue curve intersects the marginal cost curve from above	O

8. Consider the case of a firm operating with a downward sloping marginal cost curve and facing an average revenue which is the same at all levels of quantity consumed. Moreover, assume that the marginal cost curve intersects the flat average revenue curve from above but always remains positive. Assuming zero fixed costs, which of the choices below correctly captures all possible levels of profit maximizing output?

(i)	0 and indeterminate	O
(ii)	Indeterminate	O
(iv)	0	O
(v)The output corresponding to the intersection of the marginal cost and average revenue curve		O
(vi) None of the above		O

9.A foolish king orders that the only two goods on sale in his kingdom (to be purchased only from shops owned by the king) will be liquor and cucumber, thinking that he is being fair to both health conscious people and those who like to consume alcohol. For me, both goods offer a negative marginal utility irrespective of the level of consumption. I have a positive income M. When I maximise utility subject to the budget constraint, what is the amount of income that I will spend in equilibrium?

(i)	M	O
(ii)	0	O
(iii)	M/2	O
(iv)	M/3	O
(v)	M/4	O

10.The king in the question above further orders that everybody will be given the same income M everyday by the government (there will be no other sources of income) but any unspent income would have to be returned to the government exchequer. Finally, the king decides to be benevolent and announces that the income M will double from every day to the next. What happens to my utility over time?

(i) Increase   O

(ii) Decrease   O

(iii) Remain constant   O

(iv) Cannot say   O

(v) None of the above   O

10. As a plant manager, I run two machines, each of which produces a different commodity. Let these two commodities be called X and Y. The marginal cost curves for these two commodities are downward sloping in quantity produced. I am told that by my boss that quantities of X and Y produced, x and y respectively, should satisfy the constraint x+y =20. Which of the following is not a possible result of cost minimization, assuming zero fixed costs?

(i) x+y =20   O

(ii) y=0   O

(iii) x and y given by the equality of the marginal   O
     costs of x and y, subject to the constraint that
     x+y =20

(iv) x=20   O

(v) y=20   O

12. A firm sells its product in two completely segregated markets in North and South. The demand function in the North is: $x = 50 - p$ and the demand function in the South is: $x = 30 - p$. The production costs nothing. Earlier the firm used to charge two separate prices in the two markets. But the government thought that such a pricing policy is a bad idea and now forces the firm to charge the same price in the two markets Under the government intervention

(i) The firm sells higher amount of output in the   O
North and the welfare of the economy falls

(ii) The firm sells higher amount of output in the   O
North and the welfare of the economy rises.

(iii) The firm sells higher amount of output in the   O
North and the welfare of the economy remains the
same.

(iv) The firm sells higher amount of output in the   O
South and the welfare of the economy rises.

[*Note: Welfare of the economy is defined as the sum of consumer surplus and producer surplus.*]

13. Let duopolist I, producing a differentiated product, face an inverse demand function given by $p_1 = 100 - 2q_1 - q_2$ and have a cost function $c_1 = 2.5 \, q_1^2$. Assume it is common knowledge that duopolist II wishes to maintain a market share of 1/3.

(i)Optimal output of duopolist I is 20 and price of   O
its product is 50.

(ii) Optimal output of duopolist I is 20 and price of   O
its product is 75.

(iii)Optimal output of duopolist I is 10 and price of   O
its product is 50.

(iv)Optimal output of duopolist I is 10 and price of   O
its product is 75.

Section B: Macro Economics

2x13= 26

14. Consider the following information regarding a given economy in a given period of time: $I = 100$, $X = 20$ and $M = 30$. In the light of the following information, which of the following information is true?

(i) Aggregate domestic saving in the given economy in the given   O
period is 100

(ii)Aggregate domestic saving in the given economy in the given   O
period is 120

(iii)Aggregate domestic saving in the given economy in the given   O
period is 70

(iv) Aggregate domestic saving in the given economy in the given   O
period is 90

15. Consider a Simple Keynesian Model, where involuntary changes in inventory at $Y = 100$ and at $Y = 300$ are 10 and 50 respectively. Given this information, which of the following statements is true:

(i) The aggregate demand function of the model is given by $10 + 0.8Y$ O

(ii) The aggregate demand function of the model is given by $20 + 0.8Y$ O

(iii) The aggregate demand function of the model is given by $10 + 0.6Y$ O

(iv) It is given by none of the above.   O

16. In a Simple Keynesian Model for a closed economy $I = 100$, aggregate private saving is given by

$S = -20 + 0.2\ Y$ and equilibrium Y is 1000. Government's budget deficit in equilibrium in this model is given by

(i)   -200   O

(ii)   -80   O

(ii)   0   O

(iv) None of the above   O

17. In the IS-LM model, following an exogenous increase in money supply by 10 units, the LM curve shifts vertically by -2 and horizontally by 5 units. The slope of the LM curve is given by

 (i) 5/2   O

(ii)   2/5   O

(iii)   15/12   O

(iv)   None of the above   O

18. The slope of an IS curve is -2 and it passes through the point (Y=100, r=10). The equation of the IS curve is given by

(i) $2Y + r = 210$ O

(ii) $Y + 2r = 110$ O

(iii) $2Y + 0.5r = 200$ O

(iv) None of the above   O

19. In a Complete Keynesian Model, aggregate demand for goods and services is completely insensitive to interest rate. It is a function of Y alone. In such a case, aggregate demand schedule in the (Y,P) plane is

(i) horizontal   O

(ii) vertical   O

(iii) upward sloping   O

(iv) none of the above   O

20. Consider the following information regarding an economy: $Y = K^{0.5}L^{0.5}$, $S = 0.2Y$, $I = 2000/r$, $L_{sT} = 100$, $K_T = 100$, $d = 0$, where L_{sT} and K_T denote labour supply and capital stock at the point of time T and d denotes depreciation. It is also given that labour supply grows at the rate of 20 percent per unit of time. Assume that the classical theory holds good in the given economy. In the light of the given information, answer the following questions:

 The level of real wage rate and that of consumption in the given economy at the point

 of time T are given by :

 (i) ¼   and 400   O

 (ii) ½ and 80   O

 (iii) 1/8 and 200   O

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21. The rate of growth of capital stock over time in the given economy is given by

(i) 20 percent   O

(ii) $0.2\ k_t^{-0.5}$, where k_t denotes capital labour ratio at the point of time t.   O

(iii) 20 percent plus the rate of technological progress   O

(iv) None of the above   O

22. Rate of growth of aggregate output in the given economy is

(i) the same as the rate of growth of capital   O

(ii) the same as the rate of growth of labour   O

(iii) given by $0.5k_t^{-0.5}$ O

(iv) given by $0.1k_t^{-0.5} + 0.1$ O

23. The time path of real wage rate (W/P) is given by any one of the following:

(i) (W/P) remains stable at ¼ over time.   O

(ii) It falls steadily over time   O

(iii) It will remain fixed at ½ from the point of time T onward   O

24. The time path of interest rate is given by any one of the following

(i) It will go on rising over time   O

(ii) It will go on falling over time   O

(iii) It is derivable from the time path of k_t as r_t is given by $[10000/L_0 e^{0.2t}]k_t^{-0.5}$ O

(iv) It cannot be derived from the information given   O

25. Suppose at the initial point of time per capita output in the given economy was 100. Then, which of the following statements is true:

(i) It will go on falling over time.   O

(ii) It will go on rising over time   O

(iii) It will remain stable over time   O

(iv) None of the above is true.   O

26. Suppose in the given economy at the initial point of time (s/v), where v is the capital-output ratio, was equal to 0.1. Then one of the following statements is true regarding the behavior of (s/v) over time:

(i) It will go on rising over time   O

(ii) It will go on rising over time until the point of time T is reached.   O

(iii) It will go on falling over time   O

(iv) It will go one falling over time until the point of time T is reached.   O

Section C: Mathematical Economics

2x12= 24

27. The indirect utility function from the Cobb-Douglas utility function $u = x_1^a x_2^b$ with a + b = 1 is

(i) $\left(\dfrac{a^a b^b}{P_1^a P_2^b} \right) m$ O

(ii) $\left(\dfrac{P_1^a P_2^b}{a^a b^b} \right) m$ O

(iii) $\left(\dfrac{P_1^a b^b}{P_2^b a^a} \right) m$ O

(iv) $\left(\dfrac{a^b b^a}{P_1^b P_2^a} \right) m$ O

Where P_1 , P_2 and m denote the price of the two commodities and money holding respectively.

28. For each of the following functions state whether or not it is homothetic in (x1; x2)

a) $cx_1^3 + dx_1^2 x_2 + ex_1 x_2^2 + fx_1^3$

(b) $\dfrac{cx_1^3 + dx_1^2 x_2 + ex_1 x_2^2 + fx_1^3}{(ax_1 + bx_2)^3}$

(c) $x_1^\alpha x_2^\beta$ where $\alpha > 0$ and $\beta > 0, do\,not\,assume\,that\,\alpha + \beta = 1$

(d) $\alpha \ln x_1 + \beta \ln x_2$ where $\alpha > 0$ and $\beta > 0$

(i)All of the above functions are homothetic   O

(ii)a, b, c are homothetic but d is non homothetic   O

(iii) a and c are homothetic & b and d are non-homothetic   O

(iv)   a, c, d are homothetic but b is non homothetic   O

29. Consider the following nonlinear difference equation for population growth:

$$x_{n+1} = \frac{kx_n}{b+x_n}, \quad b, k > 0.$$

The above equation have stable non trivial steady state if :

(i)   b>k   O

(ii)   k>b   O

(iii)   b= k   O

(i)   None of the above   O

30. The function $erf(x) = \frac{2}{\sqrt{\pi}} \int_0^x e^{-t^2} dt$ is called the error function which cannot be calculated

exactly. However, one can expand the integrand as a Taylor polynomial and conduct integration. The approximate value of $erf(2,0)$ using the first three terms of the Taylor series around t=0 is

(i) 1.5330   O

(ii) 0.99532   O

(iii) -0.75225   O

(iv) 2.8586   O

31. Using Cramer's rule solve the following system of equations and find the solution:

$$x + 3y + 4z = 10$$
$$2x + 2y + z = 5$$
$$3x - 3y - 9z = 3$$

(i) $x = y = z = 0$ O

(ii) $x = 0, \ y = 2, \ z = 1$ O

(ii) $x = 2, y = 1, z = 0$ O

(iv) None of the above.   O

32. Suppose $f(x, y)$ where x and y are real, is a differentiable function satisfying the following properties:

(a) $f(x+k, y) = f(x, y) + ky$

(b) $f(x, y+k) = f(x, y) + kx$

(c) $f(x,0) = m$, where m is a constant.

Thus $f(x, y)$ is given by:

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(i)   m+x+y   O

(ii)   m+xy   O

(iii)   mxy   O

(i)   None of the above   O

33. Let $g(x) = f(x) + f(1-x)$ and $f'(x) < 0$ for all $x \in (0,1)$. Then the interval in which $g(x)$ is increasing is

(i)   (1/2, 1)   O

(ii)   (0,1/2)   O

(iii)   (0,1/2)∪(1/2,1)   O

(iv)   None of these   O

34. The following system of linear equations

   $2x+2y-3z=1$

   $4x+4y+z=2$

   $6x+6y-z=3$

has:

(i) A unique solution   O

(ii) Infinite solutions   O

(iii) No solution   O

(iv) Two solutions   O

35. Suppose the firm faces a demand curve for its product P = 32 - 2Q, and the firm's costs of production and marketing are $C(Q) = 2Q^2$. The maximum profit is :

(i)   24   O

(ii)   52   O

(iii) 64   O

(iv) 34   O

36. For the consumer's utility maximization problem is written as:

Max U= $[xy+ y^2 + 2x + 2y]$ subject to $6x+ 10y = m$

(i) $\left. \dfrac{dU *}{dm} \right|_{m=20} = 1/4$ O

(ii) $\left. \dfrac{dU *}{dm} \right|_{m=20} = 7/24$ O

(iii) $\left. \dfrac{dU *}{dm} \right|_{m=20} = 7/12$ O

(iv) $\left. \dfrac{dU *}{dm} \right|_{m=20} = 5/24$ O

37. Consider the following limits:

a) $L_1 = \lim\limits_{(x,y)\to(0,0)} \dfrac{3x^2 y^3}{(x^2 + y^2)^2}$

b) $L_2 = \lim\limits_{(x,y)\to(0,0)} \dfrac{x^4 y}{(2x^6 + y^3)}$

(i)   Both the limits do not exist   O

(ii) L_1=0; L_2=0   O

(iii) L_1 does not exist but L_2=0   O

(iv) L_1=0 but L_2 does not exist.   O

38. Consider the problem

Max $f(x, y) = 2 - (x - 1)^2 - e^{y^2}$ subject to $x^2 + y^2 \le a$ where a>0

(i)For 0<a<1 $x = \sqrt{a}$ y=0 and $\lambda = a^{-1/2} - 1$ and $a \ge 1$ x=1 y=0 λ=0   O

(ii)For 0<a<1 x=1 y=0 λ=0 and for $a \ge 1$ $x = \sqrt{a}$ y=0 and $\lambda = a^{-1/2} - 1$ O

(iii)For 0<a<1 $x = a^{-1/2}$ y=1 and $\lambda = a^{1/2} - 1$ and for $a \ge 1$ x=1 y=1 λ=0   O

(iv) For 0<a<1 $x = 0$ y= $a^{-1/2}$ and $\lambda = a^{1/2} - 1$ and for $a \ge 1$ x=1/2 y=1 λ=0   O

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Section D: Statistics and Econometrics

2x12= 24

39. In a bolt factory, machines A, B and C manufacture 25%, 35% and 40% respectively of the total output of bolts. Of their outputs, 5%, 4% and 2% respectively are defective. A bolt is chosen at random from the factory's output and found to be defective. What is the probability that it came from machine A?

    (i)   0.3623   O

    (ii)   0.512;   O

    (iii)   0.25   O

    (iv)   0.0125   O

40. Suppose a variable Y assumes 100 values- 40 zeroes and 60 ones. What will be the mean deviation of Y about its arithmetic mean?
    (i)   0.24   O

    (ii)   0.48   O

    (iii)   0   O

    (iv)   1   O

41. A researcher has large number of data pairs on age and height of adult male of ages between 21 to 60. What value of correlation coefficient should she expect?
    (i) Positive value   O

    (ii) Negative value   O

    (iii) 1   O

    (iv) 0   O

42. If X is a random variable $E(|X|)....\sqrt{E(X^2)}$. Fill the gap with appropriate equality or inequality sign indicating the relationship between $E(|X|)$ and $\sqrt{E(X^2)}$.
    (i)   =,   O

    (ii) $\leq$,   O

    (iii) $\geq$,   O

    (iv)   <   O

43. A box contains 10 marbles out of which θ are white and the rest are red. We want to test the hypothesis $H_0:\theta=5$ against $H_1:\theta=4$. Suppose that H_0 is rejected if two marbles taken at random with replacement, are both red. Calculate probability of type I error.

(i)   1/4   O

(ii) 16/25   O

(iii) 1/3   O

(iv) 2/9   O

44. Suppose that snowfall S is uniformly distributed between 2 and 7 inches. a. Determine the variance of snowfall.

(i)   25/4   O

(ii)   25/12   O

(iii) 28/4   O

(iv) 28/12   O

45. If a classical linear regression model contains lagged dependent variables OLS slope coefficients will be

(i) Inconsistent   O

(ii) Biased   O

(iii) Both biased and inconsistent   O

(iv) Neither biased nor inconsistent   O

46. A necessary condition for consistency of OLS estimators under heteroscedasticity is that the largest characteristic root of the error variance-covariance matrix be

(i) Zero   O

(ii) Unity   O

(iii) Finite   O

(iv) Unbounded   O

47. If a regression contains lagged dependent regressors andautocorrelated disturbances OLS estimators of regression coefficients may be

                                                                                                   O
(i) Inconsistent
  (ii) Biased   O

   (iii)Both biased and inconsistent   O

   (iv) Neither biased nor inconsistent   O

48. The following estimated equation was obtained by ordinary least squares regression using quarterly data for 1960 to 1979 inclusive (T = 80).

$$\hat{y}_t = 2.20 + 0.104\, x_{1t} + 3.48\, x_{2t} + 0.34\, x_{3t}$$
$$(3.4) \quad (0.005) \quad\quad (2.2) \quad\quad (0.15)$$

Standard errors are in parentheses, the explained sum of squares is 112.5 and the residual sum of squares is 19.5. Find $\overline{R}^2$.

(i) 0.85   O

(ii) 0.86   O

(iii) 0.8   O

(iv) 0.78   O

49. Let there be two independent unbiased estimators of the same parameter θ, say, $\hat{\theta}_1$ and $\hat{\theta}_2$, with different variances υ_1 and υ_2. What linear combination $\hat{\theta} = c_1 \hat{\theta}_1 + c_2 \hat{\theta}_2$ is the minimum variance unbiased estimator of θ?

(i) $c_1 = (\upsilon_1 + \upsilon_2)/\upsilon_1, c_2 = (\upsilon_1 + \upsilon_2)/\upsilon_2$ O

(ii) $c_1 = (\upsilon_1 + \upsilon_2)/\upsilon_2, c_2 = (\upsilon_1 + \upsilon_2)/\upsilon_1$ O

(iii) $c_1 = \upsilon_1/(\upsilon_1 + \upsilon_2), c_2 = \upsilon_2/(\upsilon_1 + \upsilon_2)$ O

(iv) $c_1 = \upsilon_2/(\upsilon_1 + \upsilon_2), c_2 = \upsilon_1/(\upsilon_1 + \upsilon_2)$ O

50. Given the two random variables X and Y with joint probability density

$$f(x, y) = \begin{cases} xe^{-x(1+y)} & x > 0,\ y > 0 \\ 0 & elsewhere; \end{cases}$$

find the theoretical regression of Y on X

(i) $(x - 1)/x^2$ O
(ii) $x^2/(x - 1)$ O

(iii) $1/x$ O

(iv) $1/x^2$ O

Rough Work (page 1)

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