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M.Sc ENTRANCE EXAM SAMPLE QUESTIONS

BASIC MATHEMATICS, ECONOMICS AND ADVANCED MATHEMATICS

This document consists of two sets of Sample Questions (SET I and SET II) of the M.Sc Entrance Exam, which is in addition to the sample questions given in the Information Handout. Please note that the sample questions are provided for three sections of the admission test question paper -- Basic Mathematics (Test II) and Economics (Test IIIA) or Advanced Mathematics (Test IIIB). The questions are illustrative and not exhaustive. In the actual examination you may find questions of a higher difficulty level on some or all of these types and also questions on the types not mentioned here.

SET I

Test II: TEST OF BASIC MATHEMATICS

This test is designed to examine the candidate's mathematical abilities.

Q.1. Let $f(x) = x\log(1 + x^{-1})$, $0 < x < \infty$. Then, $lim_{n\to\infty} f(x)$ is:

(1) 1

(2) 0

(3) e (i.e., exponent)

(4) Undefined

(5) None of the above.

Q.2. The function $f(x) = -e^{-x}$ is

(1) Convex

(2) Concave

(3) Linear

(4) Quasi-linear

(5) None of the above.

Q.3. Given $f(x) = \sqrt{x}$, then $f^{-1}(f(x))$ is:

(1) x

(2) x^2

(3) $\sqrt{x}$

(4) $\sqrt{x^2}$

(5) None of the above.

Q.4. Six horses are running a race. How many different groups of horses could make up the first three finishers?

(1) 6

(2) 18

(3) 20

(4) 120

(5) 720

Q.5. What are the values of x that satisfy the equation $x^2+4x+3=0$

(1) -3

(2) -1

(3) -3 and -1

(4) 3 and 4

(5) 4

Q.6. A company's profits have doubled for each of the 4 years it has been in existence. If the total profits for the last four years were Rs. 30 million, what were the profits in the first year of operation?

(1) Rs.1 million

(2) Rs. 2 million

(3) Rs. 4 million

(4) Rs.4.5 million

(5) Rs. 6 million.

Q.7. Find the area of the triangle ABC whose vertices are A(1,-1,2) , B(2,1, -1) and C (3,-1,2)

(1) $2\sqrt{13}$

(2) $\sqrt{13}$

(3) $\sqrt{15}$

(4) $\sqrt{26}$

(5) 13

Q.8. The number of solutions of $|x+1|=|x-1|$ is

(1) 0

(2) 1

(3) 2

(4) 3

(5) None of the above

Q.9. Find the sum of the infinite series whose n^{th} term is $\frac{n}{(n-1)!}$

(1) 2e-1

(2) 2e+1

(3) e-1

(4) e+1

(5) 2e

Q.10. The ratio of sum of first 3 terms of a Geometric Progression to the sum of first 6 terms is 64:91. The common ratio of GP is

(1) $\frac{3}{4}$

(2) $\frac{1}{2}$

(3) $\frac{1}{4}$

(4) $\frac{2}{3}$

(5) None of the above

Q.11. Y varies with respect to the sum of 2 components; of which one varies directly with X and the other inversely with X. If Y = 6, X= 4 and if $Y = \frac{10}{3}$, X= 3; the relation between X and Y is,

(1) $Y = 2X - \frac{8}{X}$

(2) $Y = X + \frac{4}{X}$

(3) $Y = -2X + \frac{4}{X}$

(4) $Y = 2X + \frac{4}{X}$

(5) None of the above

Q.12. The sum of the series $1 + \frac{1}{3}.\frac{1}{4} + \frac{1}{5}.\frac{1}{4^2} + \frac{1}{7}.\frac{1}{4^3} + \ldots\ldots\ldots\infty = ?$

(1) ln 3

(2) ln 4

(3) ln 2

(4) ln 5

(5) None of the above

Q.13. If the line *y= mx+5* be a tangent to the ellipse $7x^2 + 9y^2 = 63$, then m = ?

(1) ± 1

(2) ± 2

(3) -1

(4) $\pm \sqrt{2}$

(5) None of the above

Q.14. The common region represented by the inequalities $3x+5y \leq 15$, $5x+2y \leq 10$, $x \geq 0$ and $y \geq 0$ is

(1) a triangle

(2) a quadrilateral

(3) a rectangle

(4) a pentagon

(5) None of the above

Q.15. $\underset{x \to a}{Lt} \dfrac{x \sin a - a \sin x}{x - a}$ is equal to

(1) $\sin a$

(2) $-a \cos a$

(3) $\sin a - a \cos a$

(4) $a \sin a$

(5) None of the above

Q.16. X= 6-8i, where i is imaginary. Then |X| is

(1) 1

(2) 10

(3) 9

(4) 16

(5) 5

Q.17. Radius of the circle $x^2 + y^2 - 6x + 4y - 3 = 0$ is

(1) 4

(2) 3

(3) 2

(4) 6

(5) 10

Q.18. $x = (1+y)^{-4}$ and $y = -2\log t$. The derivative of x with respect to t is

(1) $\frac{8}{t}$

(2) $\frac{8}{t.(1+y)^3}$

(3) $\frac{8}{t.(1+y)^5}$

(4) $\frac{4}{t.(1+y)^3}$

(5) $\frac{8logt}{(1+y)^3}$

Q.19. The limit of $\frac{c^{1-\theta}-1}{1-\theta}$ as $\theta \to 1$ is equal to

(1) (1) 0

(2) (2) π

(3) (3) ∞

(4) (4) 1

(5) (5) $\log(c)$

Q.20. Find $\log_{10}(\frac{4}{17}) + \log_{10}(68)$

(1) $\log_{10}(8)$

(2) $\log_{10}(16)$

(3) $\log_{10}(68\frac{4}{17})$

(4) $\log_{10}(\frac{72}{17})$

(5) None of the above

Q.21. The derivative of the inverse of the function $y = f(x) = (x^5 + 3)$ is given by

(1) $\frac{1}{5}(y-3)^{-\frac{1}{5}}$

(2) $\frac{4}{5}(y-3)^{-\frac{4}{5}}$

(3) $\frac{4}{5}(y-3)^{-\frac{1}{5}}$

(4) $\frac{1}{5}(y)^{-\frac{4}{5}}$

(5) None of the above

Q.22. The equation of the tangent to the circle $x^2 + y^2 - 6x - 2y + 2 = 0$ at the point (1,-1) is:

(1) $x + y = 2$

(2) $3x - y = 0$

(3) $x - y = 0$

(4) $x + y = 0$

(5) None of the above

Q.23. Solve $\frac{dy}{dt} = 2$, given initial value $y(0) = 5$

(1) 2+5t

(2) 5+2t

(3) 2t

(4) 2y+5t

(5) 5y+2t

Q.24. A card is selected at random from a deck of 52 cards. What is the probability that the card selected is a Queen or a Spade?

(1) $\frac{1}{13}$

(2) $\frac{1}{4}$

(3) $\frac{4}{13}$

(4) $\frac{1}{26}$

(5) $\frac{1}{2}$

Q.25. Out of 50 consecutive natural numbers, two are chosen at random. What is the probability that the sum of the numbers is odd ?

(1) $\frac{1}{2}$

(2) $\frac{1}{4}$

(3) $\frac{12}{25}$

(4) $\frac{25}{49}$

(5) None of the above

Q.26. If sum of the roots of $ax^2 + bx + c = 0$ is equal to the sum of their squares then,

(1) $2ab = ac + c^2$

(2) $2ab = bc + c^2$

(3) $2bc = ac + c^2$

(4) $2bc = ab + b^2$

(5) $2ac = ab + b^2$

Q.27. The distance between foci of the hyperbola $x^2 - y^2 = 16$ is

(1) 8

(2) $8\sqrt{2}$

(3) $2\sqrt{8}$

(4) 4

(5) None of the above

Q.28. If the function $f(x) = \frac{ax+b}{(x-1)(x-4)}$ has a local maxima at (2, -1), then

(1) b =1, a =0

(2) a=1, b = 0

(3) b = -1, a =0

(4) a = -1, b =0

(5) None of the above

Q.29. $x = \frac{1-\sqrt{y}}{1+\sqrt{y}}$ implies $\frac{dy}{dx}$ is equal to

(1) $\frac{4}{(x+1)^2}$

(2) $\frac{4(x-1)}{(1+x)^3}$

(3) $\frac{x-1}{(1+x)^3}$

(4) $\frac{4}{(x+1)^3}$

(5) None of the above

Q.30. If $F(x) = f(g(x)), where\ f(-2) = 8, f'(-2) = 4, f'(5) = 3,$

$g(5) = -2,\ g'(5) = 6, find\ F'(5).$

(1) 24 (2) 8 (3) 12 (4) 20 (5) None of the above

Q.31. If $\int_{-1}^{4} f(x)dx = 4 \; and \; \int_{2}^{4}[3 - f(x)]dx = 7$, then the value of $\int_{-1}^{2} f(x)dx$ is

(1) -2 (2) 3 (3) 5 (4) 8 (5) None of the above

Q.32. $\int_{-2}^{2}|1 - x^2|dx \; is \; equal \; to$

(1) 4 (2) 2 (3) -2 (4) 0 (5) None of the above

Q.33. Function $f(x) = 2 + 4x^2 + 6x^4 + 8x^6$ has

(1) Many maxima and many minima
(2) No maxima and no minima
(3) Only one minima
(4) Only one maxima
(5) None of the above

Q.34. If $f'(x) = \sqrt{x}$ and $f(1) = 2, then \; f(x) \; is \; equal \; to$

(1) $\frac{3}{2} x^{\frac{3}{2}}$
(2) $\frac{3}{2} x^{\frac{3}{2}} + \frac{4}{3}$
(3) $\frac{2}{3} x^{\frac{3}{2}}$
(4) $\frac{2}{3} x^{\frac{3}{2}} + \frac{4}{3}$
(5) None of the above

Q.35. Suppose that there is a 6-sided die that is weighted in such a way that each time the die is rolled, the probabilities of rolling any of the numbers 1 to 5 are all equal but the probability of rolling a 6 is twice the probability of rolling a 1. When you roll the dies once, the 6 outcomes are not equally likely. What is the probability of the most likely event?

(1) 1/7
(2) 2/7
(3) 1/3
(4) 1/6
(5) 1/2

Q.36. Find the mean of the following probability distribution

X	8	12	16	20	24
P(X)	1/8	1/6	3/8	1/4	1/12

(1) 20

(2) 12

(3) 16

(4) 18

(5) 24

Q.37. Let $y = \sqrt{(3 + 4x - x^2)}$. What is $\frac{dy}{dx}$?

(1) $-2x + 4$

(2) $\frac{1}{2\sqrt{(3+4x-x^2)}}$

(3) $\frac{2-x}{-2x+4}$

(4) $\frac{2-x}{y}$

(5) None of the above

Q.38. Find $\frac{dy}{dx}$ for $y = e^{2x}\, sin^2 3x.$

(1) $2e^{2x}\, sin3x\, (sin3x + cos3x)$

(2) $2e^{2x}\, cos3x\, (sin3x + cos3x)$

(3) $2e^{2x}\, sin3x\, (sin3x + 3cos3x)$

(4) $2e^{2x}\, sin3x\, (sin3x - 3cos3x)$

(5) None of the above

Q.39. The equation $x^4 + y^4 + 9x - 6y = 14$ defines a curve passing through the point A(1,2). What is the equation of the tangent to the curve at A.

(1) $y = -\frac{1}{2}x + \frac{5}{2}$

(2) $y = \frac{1}{2}x - \frac{3}{2}$

(3) $y = \frac{1}{2}x - \frac{5}{2}$

(4) $y = -\frac{1}{2}x + \frac{4}{2}$

(5) None of the above

Q.40. What is the solution set for the equation $x - 12 = \sqrt{x + 44}$.

(1) {5}

(2) {20}

(3) {-5,20}

(4) {5,20}

(5) None of the above

SET I

TEST III A

TEST OF ECONOMICS

This test is designed to examine the candidate's abilities in basic microeconomics and macroeconomics.

Q.1. Do you think a firm operating in a competitive market should shutdown if its revenue is R = 1000 Rupees per week, its variable cost is VC = 500 Rupees, and its sunk fixed cost is F = 600 Rupees?

(1) It should shutdown.

(2) It should not shutdown.

(3) It should shutdown if R is greater than VC.

(4) It should shutdown if R is greater than F.

(5) None of the above.

Q.2. Suppose that two linear demand curves go through the initial competitive market equilibrium, given by e^*. One demand curve is less elastic than the other one at this equilibrium e^*. Can you say for which demand curve will a price increase cause the larger consumer surplus loss?

(1) Consumer surplus loss is more for less elastic demand curve.

(2) Consumer surplus loss is more for more elastic demand curve.

(3) Consumer surplus loss is equal across demand curves.

(4) Consumer surplus does not apply to competitive market equilibrium.

(5) None of the above.

Q.3. Monopsony is a market with:

(1) Many Sellers, Many Buyers

(2) Single Seller, Many Buyers

(3) Many Sellers, Single Buyer

(4) Two Sellers, Two Buyers

(5) None of the above.

Q.4. XYZ Satellite Company broadcasts TV to subscribers in Mumbai and Pune. The demand functions for each of these groups are $q_M = 60 - 0.25\ p_M$ and $q_P = 100 - 0.50\ p_P$, where q_M and q_P are in thousands of subscriptions per year in Mumbai and Pune respectively, and p_M and p_P are the subscription prices per year in Mumbai and Pune respectively. The cost of providing q units of service is given by C = 1000 + 40q, where $q = q_M + q_P$. The profit maximizing prices and quantities for Mumbai and Pune markets are:

(1) $q_M = 25, q_P = 40;\ p_M = 140, p_P = 120$

(2) $q_M = 25, q_P = 40;\ p_M = 120, p_P = 140$

(3) $q_M = 40, q_P = 25;\ p_M = 140, p_P = 120$

(4) $q_M = 60, q_P = 100;\ p_M = 140, p_P = 120$

(5) None of the above.

Q.5. Well behaved Consumer preferences are:

(1) Concave

(2) Convex

(3) Both Concave as well as Convex

(4) Sine curve

(5) None of the above.

Q.6. Lexicographic Preference Relation is:

(1) Not a valid preference relation, but continuous

(2) Valid preference relation, but not continuous

(3) Not a valid preference relation, and also not continuous

(4) Valid preference relation, but continuous

(5) None of the above.

Q.7. Suppose there are two commodities x and y and that an economic agent's indifference curves are given by the equation of the form $y = (K - x^2)^{1/2}$ for different values of the parameter K. Can these preferences be represented by the Cobb-Douglas utility function?

(1) No

(2) Yes

(3) There is nothing called a Cobb-Douglas utility function.

(4) This has something to do with producer theory but has no relevance to consumer theory.

(5) None of the above.

Q.8. Risk averse individuals are:

(1) Willing to pay a risk premium

(2) Are not willing to pay a risk premium

(3) Are willing to accept risk premium

(4) Are not willing to accept risk premium

(5) None of the above.

Q.9. Given below is a table of the number of Televisions (TVs) purchased by a household and the marginal and total utility derived from these. Based on the table what is the marginal utility of the 4th TV?

TVs	Total Utility	Marginal Utility
1	15	15
2	25	
3		7
4	37	

(1) 10

(2) 15

(3) 7

(4) 5

(5) 37

Q.10. As compared to a perfectly competitive industry with the same costs, the equilibrium price for a monopoly would be

(1) *higher* than the case of perfect competition, with equilibrium quantities being *lower* than in the case of perfect competition.

(2) *higher* than the case of perfect competition, with equilibrium quantities too being *higher* than in the case of perfect competition.

(3) lower than the case of perfect competition with equilibrium quantities being *higher* than in the case of perfect competition.

(4) *lower* than the case of perfect competition with equilibrium quantities being *lower* than in the case of perfect competition.

(5) *lower* than the case of perfect competition with equilibrium quantities being *the same as* in the case of perfect competition.

Q.11. If a fisherman must sell all of his/her daily catch before it spoils for whatever price (s)he is offered, once the fish are caught the fisher(wo)man's price elasticity of supply for fresh fish is

(1) Zero

(2) Infinite

(3) One

(4) Two

(5) Unable to determine from this information

Q.12. When marginal costs are below average total costs,

(1) average fixed costs are rising

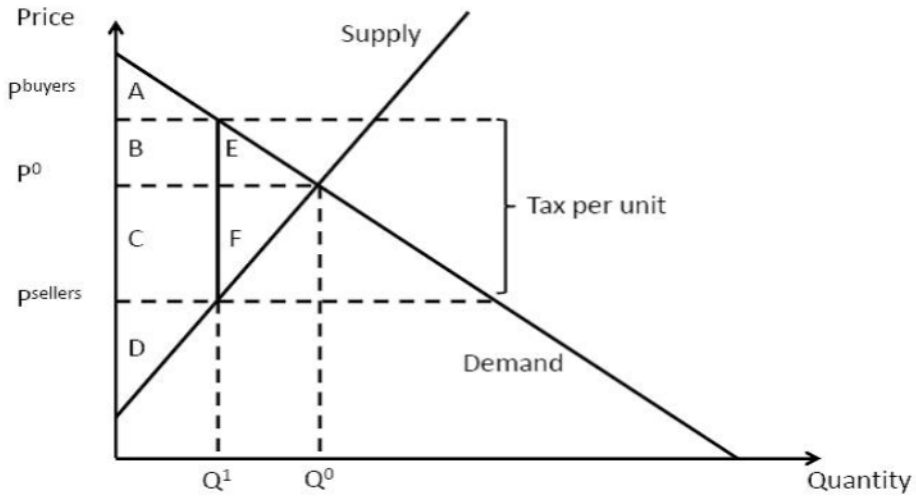
(2) average total costs are falling

(3) average total costs are rising

(4) average total costs are minimized

(5) None of the above

Q93-Q95 are based on the following figure:



Q.13. If there is no tax placed on the product in this market, consumer surplus is the area denoted by

(1) C + D + F

(2) A

(3) A + B + E

(4) D + C + B

(5) D

Q.14. If there is no tax placed on the product in this market, producer surplus is the area

(1) A+B+E

(2) D

(3) C+F

(4) A+B+C+D

(5) A

Q.15. If a tax is placed on the product in this market, tax revenue paid by the buyers is the area

(1) B+C+E+F

(2) B

(3) B+C

(4) A

(5) E+F

Q.16. National income is nothing more than the sum of all individual incomes. With regard to national income accounts which of the following statements are **false.**

a. In national income accounts income earned and income receipts are not identical concepts.

b. In national income accounts capital gains are not counted as a part of income.

c. An increase in inventories of only intermediate goods is counted as a part of national product.

(1) a and b

(2) b and c

(3) a and c

(4) c only

(5) a only

Q.17. Consider a closed economy. Suppose we assume that i~+g [planned investment (which includes planned inventory accumulation) + govt. expenditure] are fixed i.e. they do not vary with income, and the sum of s+t (savings plus taxes) is positively related to income. For some reason people now desire to save more, which of the following statements would be ***true.***

a. s+t will be unchanged but income will fall.

b. s+t will be unchanged and income will rise.

c. s+t will rise and income will be unchanged.

(1) a only

(2) a and b

(3) b and c

(4) a and c

(5) c only

Q.18. Equilibrium in the product market is represented by the IS curve. With respect to the equilibrium in the product market which of the following statements are **true**.

a. The IS curve represents a causal relation between the rate of interest and income.

b. The slope of the IS curve is influenced by the marginal propensity to consume.

c. An increase in government expenditure shifts the IS curve to the right.

(1) a only

(2) a and b

(3) b and c

(4) a and c

(5) c only

Q.19. Money is the stock of assets that can be readily used to make transactions. With respect to the various issues regarding the definition, measurement and evolution of money which of the following statements are **true.**

a. Attempts by governments to reduce transaction costs and changes in technology largely explain the evolution of money in modern times.

b. Disagreements about monetary policy sometimes arise because different measures of money may move in different directions.

c. Widespread use of automatic teller machines in recent years has decreased the velocity of money.

(1) a and b

(2) b and c

(3) a and c

(4) a only

(5) c only

Q.20. The national income accounts identity shows that the international flow of funds to finance capital accumulation and the international of goods and services are two sides of the same coin. In an open economy which of the following statements are **false.**

a. Net exports (exports-imports) are always equal to output minus domestic spending.

b. If savings are less than investment this reflects a trade surplus.

c. If savings are less than investment this reflects the fact that net foreign investment is positive.

(1) a and b

(2) b and c

(3) a and c

(4) a only

(5) b only

Q.21. Stabilization Policy is Public (Monetary and Fiscal) policy aimed at keeping output and employment at their natural rates. In this context consider a simple Keynesian Macroeconomic Model of a closed economy represented by the equilibrium conditions in the product market (downward sloping IS curve), money market (upward sloping LM curve), labour market and an aggregate production function. Suppose at the initial equilibrium the government believes that unemployment rate is far above its natural rate and so it decides to increase money supply keeping government expenditure and tax rates at the initial level. In this context which of the following statements would be **true?**

a. Investment in the new equilibrium will necessarily be lower than in the initial equilibrium.

b. Both employment and output are higher in the new equilibrium.

c. With a given slope of the IS curve, the increase in money supply will have a greater effect on output at higher levels of the interest rate compared to very low levels of the interest rate.

(1) a and b

(2) b and c

(3) a and c

(4) a only

(5) c only

Q.22. Consider a small open economy with perfect capital mobility and floating exchange rates (a system where the exchange rate is allowed to fluctuate freely in response to changing economic conditions). The exchange rate is defined as the amount of foreign currency per unit of domestic currency and both domestic and foreign price levels are assumed to be fixed. Suppose the government initiates an expansionary fiscal policy by increasing government expenditures. Which of the following statements would be **true**?

a. The domestic currency appreciates.

b. The new equilibrium output is higher than the initial equilibrium output.

c. The fiscal expansion causes a reduction in national savings.

(1) a and b

(2) b and c

(3) a and c

(4) a only

(5) c only

Q.23. *Discounting* refers directly to

(1) finding the present value of a future sum of money.

(2) finding the future value of a present sum of money.

(3) calculations that ignore the phenomenon of compounding for the sake of ease and simplicity.

(4) decreases in interest rates over time, while *compounding* refers to increases in interest rates over time.

(5) none of the above.

Q.24. A production possibilities frontier is a straight line when

(1) the more resources the economy uses to produce one good, the fewer resources it has available to produce the other good.

(2) an economy is interdependent and engaged in trade instead of self-sufficient.

(3) the rate of tradeoff between the two goods being produced is constant.

(4) the rate of tradeoff between the two goods being produced depends on how much of each good is being produced.

(5) none of the above.

Q.25. For an imaginary economy, the value of the consumer price index was 140 in 2013, and the inflation rate was 5.0 percent between 2013 and 2014. The consumer price index in 2014 was

(1) 145.0.

(2) 147.0.

(3) 135.0.

(4) 133.3.

(5) none of the above.

Q.26. Net capital outflow equals

(1) the value of domestic assets purchased by foreigners.

(2) the value of foreign assets purchased by domestic residents.

(3) the value of domestic assets purchased by foreigners - the value of foreign assets purchased by domestic residents.

(4) the value of foreign assets purchased by domestic residents - the value of domestic assets purchased by foreigners.

(5) none of the above.

Q.27. A U.S. firm buys bonds issued by a technology center in India. This purchase is an example of U.S.

(1) foreign portfolio investment. By itself it is an increase in U.S. holdings of foreign bonds and increases U.S. net capital outflow.

(2) foreign portfolio investment. By itself it is an increase in U.S. holdings of foreign bonds and decreases U.S. net capital outflow.

(3) foreign direct investment. By itself it is an increase in U.S. holdings of foreign bonds and increases U.S. net capital outflow.

(4) foreign direct investment. By itself it is an increase in U.S. holdings of foreign bonds and decreases U.S. net capital outflow.

(5) none of the above.

Q.28. Which of the following reduces the interest rate?

(1) an increase in government expenditures and an increase in the money supply

(2) an increase in government expenditures and a decrease in the money supply

(3) a decrease in government expenditures and an increase in the money supply

(4) a decrease in government expenditures and a decrease in the money supply

(5) none of the above.

Q.29. Which of the following is *not* correct?

(1) In the short run, policymakers face a tradeoff between inflation and unemployment.

(2) Events that shift the long-run Phillips curve right shift the long-run aggregate supply curve left.

(3) Unemployment can be changed only by the use of government policy.

(4) The decrease in output associated with reducing inflation is less if the policy change is announced ahead of time and is credible.

(5) none of the above.

Q.30. Suppose the economy is in long-run equilibrium. In a short span of time, there is an increase in the money supply, a tax decrease, a pessimistic revision of expectations about future business conditions, and a rise in the value of the dollar. In the short run, we would expect

(1) the price level and real GDP both to rise.

(2) the price level and real GDP both to fall.

(3) the price level and real GDP both to stay the same.

(4) All of the above are possible.

(5) none of the above.

SET I

TEST III -B

TEST OF ADVANCED MATHEMATICS

This test is designed to examine the candidate's abilities in advanced level mathematics.

Q.1. A linearly ordered set is said to be Well-ordered if every nonempty subset of it has a:

(1) Least element
(2) Maximal element
(3) Positive element
(4) Negative element
(5) None of the above

Q.2. Take a set S and a point s. Consider the following two statements.

For every $\varepsilon > 0$, S contains infinitely many points of $(s-\varepsilon, s+\varepsilon)$.

For every $\varepsilon > 0$, S contains a point other than s of $(s-\varepsilon, s+\varepsilon)$.

These two statements are:

(1) Contradictory
(2) Not related to one other
(3) Equivalent
(4) Illogical
(5) None of the above.

Q.3. The intersection of any finite collection of open sets is:

(1) Open
(2) Closed
(3) Both Open and Closed
(4) Empty
(5) None of the above.

Q.4. A set and its inverse image _____ cardinality. The blank is filled with:

(1) Need to have the same
(2) Need to have positive
(3) Need not have the same
(4) Need to have negative
(5) None of the above.

Q.5. If every continuous, real valued function defined on a set has the intermediate value property on that set, then it is:

(1) Convex

(2) Complete

(3) Connected

(4) Compact

(5) None of the above.

Q.6. The only connected subsets of the rational numbers are sets with:

(1) One element

(2) Two elements

(3) Three elements

(4) Infinite elements

(5) None of the above.

Q.7. If f: A $\rightarrow$ **R** is continuous and A is compact, then f is:

(1) Discontinuous on A

(2) Discontinuous on **R**

(3) Continuous on **R** – A

(4) Uniformly continuous on A

(5) None of the above.

Q.8. A set is _____ and _____ if and only if it has the covering property. The blanks are:

(1) Open, Closed

(2) Closed, Complete

(3) Closed, Unbounded

(4) Closed, Bounded

(5) None of the above.

Q.9. The list of vectors (1, 2, 3), (4, 5, 8), (9, 6, 7), (-3, 2, 8) is:

(1) linearly independent in R^3

(2) not linearly independent in R^3

(3) linearly dependent in R^2

(4) not linked to linear dependence or independence

(5) None of the above.

Q.10. A matrix is called upper triangular if

(1) all the entries below the diagonal equal zero

(2) all entries below the diagonal do not equal zero

(3) all entries above the diagonal equal zero

(4) all entries above the diagonal do not equal zero

(5) None of the above.

Q.11. The differential equation $(x^2 - 3y^2)dx + 2xydy = 0$ is:

(1) first order nonhomogeneous.

(2) first order homogeneous.

(3) second order non-homogeneous.

(4) second order homogeneous.

(5) None of the above.

Q.12. What is the maximum value of $f(x, y) = x^2 y$ given that $x^2 + y^2 = 1$?

(1) $\frac{4}{27}\sqrt{3}$

(2) $\frac{\sqrt{3}}{9}$

(3) $\frac{\sqrt{2}}{3}$

(4) $\frac{2}{3}$

(5) None of the above

Q.13. A new brand of disposable flashlight (torch) is guaranteed to last for at least one year of normal use. Tests indicate that the lifetime of these lights under normal use is approximately normally distributed with a mean of 1.5 years and a standard deviation of 0.4 year. What proportion of flashlights will fail to meet the guarantee? [Note: F (.) is the cumulative distribution function associated with the standard normal distribution. (*i.e.* normal with mean 0 and standard deviation 1)].

(1) F (1.25)

(2) F (-1.25)

(3) [1-F(1.25)]

(4) [1-F(-1.25)]

(5) None of the above

Q.14. $\sum_{n=1}^{\infty} \frac{1}{2n(2n+1)}$ =?

(1) $\frac{1-\log 2}{1+\log 2}$

(2) $\frac{1+\log 2}{1-\log 2}$

(3) 1+log2

(4) 1-log2

(5) None of the above

Q.15. The property common to the following functions f(x) = sin(1/x) and g(x) = 1/x is that:

(1) both are discontinuous at zero

(2) both are oscillating

(3) both are bounded

(4) both are continuous at zero

(5) None of the above

Q.16. If $a + 2b + 3c = 7x$, then

(1) $a^2 + b^2 + c^2 = (x-a)^2 + (2x-b)^2 + (3x-c)^2$

(2) $a^2 + b^2 + c^2 = (x-a)^2 + (x-b)^2 + (x-c)^2$

(3) $a^3 + b^3 + c^3 = (x-a)^3 + (2x-b)^3 + (3x-c)^3$

(4) $a^2 + b^2 + c^2 = (x+a)^2 + (2x+b)^2 + (3x+c)^2$

(5) None of the above

Q.17. Simplify $log_2 8 + log_2 2$

(1) $log_2 10$

(2) $log_2 4$

(3) 4

(4) 5

(5) 6

Q.18. A line L is parallel to the line $x + 2y = 6$ and passes through the point (10, 1). Find the area of the region bounded by the line L and the axes

(1) 16 sq. units

(2) 25 sq units

(3) 49 sq units

(4) 36 sq. units

(5) None of the above

Q.19. Find the equation of tangent to the circle $(x-4)^2+(y-2)^2=16$ at point $(4+2\sqrt{2},\ 2+2\sqrt{2})$ and the other tangent that is parallel to it.

(1) $y=-x+6+4\sqrt{2},\ y=-x-6-4\sqrt{2}$

(2) $y=x+6+4\sqrt{2},\ y=x+6-4\sqrt{2}$

(3) $y=-x+6+2\sqrt{2},\ y=-x+6-2\sqrt{2}$

(4) $y=-x+6+4\sqrt{2},\ y=-x+6-4\sqrt{2}$

(5) None of the above

Q.20. If the area of an equilateral triangle is x square meters and the perimeter is x meters, then what is the length of one side of the triangle in meters?

(1) 6

(2) 8

(3) $4\sqrt{2}$

(4) $2\sqrt{3}$

(5) $4\sqrt{3}$

Q.21. For all numbers x, the operation $<>$ is defined is defined by $<x>=x-\frac{x}{5}$. If $\ll W \gg = 32$, then what is the value of W?

(1) 15

(2) 25

(3) 35

(4) 50

(5) 60

Q.22. If points (0,-3), (6,0) and (k,10) all lie on the same line, what is the value of k?

(1) 2

(2) 8

(3) 14

(4) 22

(5) 26

Q.23. For $y=3^{x^2}$, obtain $\frac{dy}{dx}$.

(1) $3^{x^2}\ x\log(9)$

(2) $3^{x^2+x}\log 3$

(3) $3^{x^2}\ 2\log(3)$

(4) $3^{x^2+x}\ 2$

(5) None of the above

Q.24. Perpendiculars are drawn from points on the line $\frac{x+2}{2} = \frac{y+1}{-1} = \frac{z}{3}$ to the plane $x + y + z = 3$. The feet of the perpendiculars lie on the line

(1) $\frac{x}{5} = \frac{y-1}{8} = \frac{z-2}{-13}$

(2) $\frac{x}{2} = \frac{y-1}{3} = \frac{z-2}{-5}$

(3) $\frac{x}{4} = \frac{y-1}{3} = \frac{z-2}{-7}$

(4) $\frac{x}{2} = \frac{y-1}{-7} = \frac{z-2}{5}$

(5) None of the above

Q.25. The area enclosed by the curves $y = sinx + cosx$ and $y = |cosx - sinx|$ over the interval $\left[0, \frac{\pi}{2}\right]$ is

(1) $4(\sqrt{2} - 1)$

(2) $2\sqrt{2}\,(\sqrt{2} - 1)$

(3) $2(\sqrt{2} + 1)$

(4) $2\sqrt{2}\,(\sqrt{2} + 1)$

(5) None of the above

Q.26. Solve the second order differential equation $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 10y = 3e^{2x}$

given that when $x = 0, y = 1$ and $\frac{dy}{dx} = 0$.

(1) $e^{-x}(e^{3x} + \sin(3x) + 5\cos(3x))$

(2) $\frac{1}{6}e^{-x}(e^{3x} + \sin(3x) + 5\cos(3x))$

(3) $\frac{1}{6}e^{-x}(\sin(3x) + 5\cos(3x))$

(4) $\frac{1}{6}e^{-x}(e^{3x} + 5\sin(3x) + 5\cos(3x))$

(5) None of the above

Q.27. Solve $2x - x^2 \geq |x - 1| - 1$

(1) [0,3]

(2) [-1,0]

(3) [0,2]

(4) [-1,2]

(5) None of the above

Q.28. The sum of first twenty terms of an arithmetic sequence is 320. The twenty-first term is 37. What is the sum of first ten terms?

(1) 60

(2) 50

(3) 40

(4) 30

(5) None of the above

Q.29. Simplify using binomial theorem $\left(\frac{x^2}{3}-\frac{2}{x}\right)^5$

(1) $\frac{x^{10}}{243}-\frac{10x^7}{81}-\frac{32}{x^5}+\frac{40x^4}{27}+\frac{40x^3}{18}+\frac{80}{3x^2}-\frac{80x}{9}$

(2) $\frac{x^{10}}{243}-\frac{10x^7}{81}-\frac{32}{x^5}+\frac{40x^4}{27}+\frac{80}{3x^2}+\frac{80x}{9}$

(3) $\frac{x^{10}}{243}-\frac{10x^7}{81}-\frac{32}{x^5}+\frac{40x^4}{27}+\frac{80}{3x^2}-\frac{80x}{9}$

(4) $\frac{x^{10}}{243}-\frac{10x^7}{81}-\frac{32}{x^5}-\frac{40x^4}{27}-\frac{80}{3x^2}-\frac{80x}{9}$

(5) None of the above

Q.30. What is the value of y in the following system

$$x+2y+3z=2,$$
$$x+y-z=0$$
$$2x+2y-z=1$$

(1) -2

(2) -1

(3) 0

(4) 1

(5) 2

M.Sc SAMPLE QUESTIONS

SET I

ANSWER KEY

TEST-II:

TEST OF BASIC MATHEMATICS

Q.No.	Choice	Q.No.	Choice
Q.1	2	Q.21	5
Q.2	2	Q.22	4
Q.3	1	Q.23	2
Q.4	3	Q.24	3
Q.5	3	Q.25	4
Q.6	2	Q.26	5
Q.7	2	Q.27	2
Q.8	2	Q.28	2
Q.9	5	Q.29	2
Q.10	1	Q.30	1
Q.11	1	Q.31	3
Q.12	1	Q.32	1
Q.13	4	Q.33	3
Q.14	2	Q.34	4
Q.15	3	Q.35	2
Q.16	2	Q.36	3
Q.17	1	Q.37	4
Q.18	3	Q.38	3
Q.19	5	Q.39	1
Q.20	2	Q.40	4

TEST-III-A:

TEST OF ECONOMICS

Q.No.	Choice
Q.1	2
Q.2	1
Q.3	3
Q.4	1
Q.5	2
Q.6	2
Q.7	1
Q.8	1
Q.9	4
Q.10	1
Q.11	1
Q.12	2
Q.13	3
Q.14	1
Q.15	3
Q.16	4
Q.17	1
Q.18	3
Q.19	1
Q.20	2
Q.21	2
Q.22	3
Q.23	1
Q.24	3
Q.25	2
Q.26	4
Q.27	1
Q.28	3
Q.29	3
Q.30	4

TEST-III-B:

TEST OF ADVANCED MATHEMATICS

Q.No.	Choice
Q.1	2
Q.2	1
Q.3	3
Q.4	1
Q.5	2
Q.6	2
Q.7	1
Q.8	1
Q.9	4
Q.10	1
Q.11	1
Q.12	2
Q.13	3
Q.14	1
Q.15	3
Q.16	4
Q.17	1
Q.18	3
Q.19	1
Q.20	2
Q.21	2
Q.22	3
Q.23	1
Q.24	3
Q.25	2
Q.26	4
Q.27	1
Q.28	3
Q.29	3
Q.30	4

SET II

Test II: TEST OF BASIC MATHEMATICS

This test is designed to examine the candidate's mathematical abilities.

Q.1. If A is a square matrix of order n, then Det(kA) = ?

(1) k. Det(A)

(2) n.k.Det(A)

(3) n^k Det(A)

(4) k^2 Det(A)

(5) k^n Det(A)

Q.2. Solve the equation $|4x + 23| = |4x - 9|$?

(1) $x = 0$

(2) $x = 8$

(3) $x = \frac{7}{4}$

(4) $x = -\frac{7}{4}$

(5) indeterminate

Q.3. The common region represented by the following inequalities is _____?

$3x + 5y \leq 15$

$5x + 2y \leq 10$

$x \geq 0 \qquad y \geq 0$

(1) a triangle

(2) a quadrilateral

(3) a pentagon

(4) a rectangle

(5) a square

Q.4. The matrix A= $\begin{bmatrix} -2 & 2 \\ 2 & -2 \end{bmatrix}$ is

(1) positive definite

(2) negative definite

(3) positive semi definite

(4) negative semi definite

(5) indefinite

Q.5. The particular solution of the differential equation $\frac{dy}{dt} - y - t^2 = 0$ is

(1) $-t^2$

(2) $t^2 - 2t$

(3) $t^2 + 2t + 2$

(4) $t^2 + 2t$

(5) Other than the given options

Q.6. The solution of the equation $dy - (1 + x + y + xy)dx = 0$, $where\ y > 0$, is = ?

(1) $\log y = x + c$

(2) $\log(1 + y) = \frac{x^2}{2} + x + c$

(3) $\log(1 + y) = x + c$

(4) $\log(1 + y) = x^2 + c$

(5) $\log y = \frac{x^2}{2} + c$

Q.7. The general solution of $\frac{\mathrm{dx}}{\mathrm{dt}} + 2\mathrm{x} = \mathrm{c}$ is

(1) 2

(2) e^{-t}

(3) $2t$

(4) 2^t

(5) Ae^{-2t}

Q.8. The maximum value of $f(x) = \frac{x}{4+x+x^2}\ on\ [-1,1]$ is:

(1) $\frac{-1}{4}$

(2) $\frac{-1}{3}$

(3) $\frac{1}{6}$

(4) $\frac{1}{7}$

(5) None of the above

Q.9. If *x log x + y log y* = 1, then $\frac{dy}{dx}$ is equal to

(1) $-\frac{\log x}{\log y}$

(2) $-\frac{\log\ ex}{\log ey}$

(3) $\frac{\log x}{\log y}$

(4) $\frac{\log y}{\log x}$

(5) None of the above

Q.10. The value of $\frac{d}{dx}(|x-1|+|x-5|)\ at\ x=3$ is

(1) -2

(2) 0

(3) 2

(4) 4

(5) 5

Q.11. $\int 2^x\, 3^{x+1} 4^{x+2} dx =$

(1) $\frac{(48)^x}{log\, 48}$

(2) $\int \frac{2^x 3^{x+1} 4^{x+2}}{log2+log4+log3}$

(3) $\frac{(24)^{x+2}}{log\, 24}$

(4) $\int \frac{2^{x+1} 3^{x+2} 4^{x+3}}{log2+log4+log3}$

(5) None of the above

Q.12. If $\int \frac{1}{f(x)} dx = \log\{f(x)\}^2 + c, then\ f(x) =$

(1) x + a

(2) 2x + a

(3) x/2 + a

(4) x^2 + a

(5) x/4 + a

Q.13. If $f(x) = \begin{cases} |x| & -1 \leq x \leq 1 \\ |x-2| & 1 < x \leq 3 \end{cases}$ then, $\int_{-1}^{3} f(x)dx$ is equal to

(1) 0

(2) 1

(3) 2

(4) 4

(5) -1

Q.14. $\int_0^1 x(1-x)^n\, dx =$

(1) $\frac{n(n+1)}{2}$

(2) $\frac{1}{(n+1)(n+2)}$

(3) $\frac{(n+1)(n+2)}{3}$

(4) $n^2\,(n+1)$

(5) None of the above

Q.15. There are 35 students in art class and 57 students in dance class. Find the number of students who are either in art class or in dance class.

(a) When two classes meet at different hours and 12 students are enrolled in both activities.

(b) When two classes meet at the same hour.

(1) 47; 69

(2) 12; 47

(3) 69; 23

(4) 80; 92

(5) 45; 22

Q.16. Each student in a class of 40 plays at least one indoor game: chess, carrom and scrabble. 18 play chess, 20 play scrabble and 27 play carrom. 7 play chess and scrabble, 12 play scrabble and carrom and 4 play chess, carrom and scrabble. Find the number of students who play chess and carrom.

(1) 10

(2) 69

(3) 19

(4) 50

(5) 40

Q.17. The partial sums of the first n and n + 1 numbers of the Fibonacci sequence are both divisible by 11. What is the smallest value of n for which this is true?

(1) 11

(2) 9

(3) 8

(4) 12

(5) 10

Q.18. An arithmetic sequence has its 5th term equal to 22 and its 15th term equal to 62. Find its 100-th term.

(1) 210

(2) 402

(3) 305

(4) 510

(5) 406

Q.19. Find the sum of the first 50 even positive integers.

(1) 2550

(2) 4210

(3) 3270

(4) 5320

(5) 3080

Q.20. Find the value of n for which the following equation is true: $\sum_{i=1}^{n}(0.25i+2)=21.$

(1) 7

(2) 24

(3) 10

(4) 32

(5) 12

Q.21. Find the sum of the following infinite series

$$\frac{1}{4}+\frac{1}{16}+\frac{1}{64}+\frac{1}{256}+\ldots$$

(1) 1/3

(2) 1/2

(3) 3/4

(4) ∞

(5) 1

Q.22. Let X be a variable with a binomial distribution, n=25 and p=0.3. Which of the following statements is true?

(1) The mean of X is 7.5 and variance is 5.25

(2) The mean of X is 7.5 and variance is 0.21

(3) The mean of X is 5 and variance is 0.09

(4) The mean of X is 0.75 and variance is 1

(5) Not listed in the answers.

Q.23. Find the mean of the following probability distribution

X	16	18	24	28	36
P(X)	1/8	1/6	3/8	1/4	1/12

(1) 20

(2) 22

(3) 24

(4) 26

(5) Not listed above

Q.24. Two dice are thrown simultaneously. What is the probability of getting two numbers whose product is even?

(1) ½

(2) ¾

(3) 3/8

(4) 5/16

(5) Not listed here

Q.25. Find $\frac{dy}{dx}$ for $y = 2^{cotx}$.

(1) $-2^{cotx}\ ln2$

(2) $-2^{cotx}\ ln2\ (sec^2x)$

(3) $-2^{cotx}\ ln2\ (cosec^2x)$

(4) $2^{cotx}\ ln2\ (cosec^2x)$

(5) None of the above

Q.26. Find $\frac{dy}{dx}$ for $y = cos^2(x^3)$.

(1) $-6x^2cos(x^3)sin(x^3)$

(2) $-6x^2cos(x^3)sin^2(x^3)$

(3) $6x^2cos(x^3)sin(x^3)$

(4) $-6x^2cos(x^3)sinx$

(5) None of the above

Q.27. Evaluate $\int x^2 e^{3x} dx$

(1) $\frac{x^2 e^{3x}}{3} - \frac{2xe^{3x}}{9} + \frac{e^{3x}}{27} + c$

(2) $\frac{x^2 e^{3x}}{3} - \frac{2xe^{3x}}{9} + \frac{2e^{3x}}{27} + c$

(3) $\frac{x^2 e^{3x}}{3} - \frac{2xe^{3x}}{9} + \frac{2e^{3x}}{9} + c$

(4) $\frac{x^2 e^{3x}}{3} - \frac{2xe^{3x}}{9} + \frac{2e^{x}}{27} + c$

None of the above

Q.28. Evaluate $\int \frac{lnx}{x^5} dx$

(1) $-\frac{ln\, x}{4x^4} + \frac{1}{16x^4} + c$

(2) $\frac{ln\, x}{4x^4} - \frac{1}{16x^4} + c$

(3) $-\frac{ln\, x}{4x^4} - \frac{1}{16x^3} + c$

(4) $-\frac{ln\, x}{4x^4} - \frac{1}{16x^4} + c$

(5) None of the above

Q.29. Determine which of the following is true.

$$f(x) = \begin{cases} 3x - 5 \; if \; x \neq 1 \\ 2 \; if \; x = 1 \end{cases}$$

(1) f is continuous at $x = 1$.

(2) f is not continuous at $x = 1$

(3) f is not continuous at $x = 2$

(4) f is not continuous at $x = 0$

(5) None of the above

Q.30. Evaluate $\lim_{x \to 0} \frac{3^x - 2^x}{x^2 - x}$.

(1) $\ln 3 - \ln 2$

(2) $\ln 2 - \ln 3$

(3) $\ln 2$

(4) 5

(5) $\ln 3$

Q.31. Find the odd man out. 1, 5, 11, 17, 23, 29.

(1) 29

(2) 11

(3) 17

(4) 1

(5) 23

Q.32. Which equation has infinitely many solutions?

(1) $x = \frac{1}{4}x + \frac{3}{4}$

(2) $\frac{1}{3}x - 5 = \frac{2}{3}x - 5$

(3) $\frac{1}{2}(1 + 4x) = 2x - 3$

(4) $3 - 4x = -6(\frac{2}{3}x - \frac{1}{2})$

(5) None of the above

Q.33. If a∗b=2a−4b+2ab, then 2∗3+3∗2=?

(1) 6

(2) 8

(3) 12

(4) 14

(5) 10

Q.34. b−[b−(a+b)−{b−(b−a+b)}+2a]=?

(1) 0

(2) $4a$

(3) a

(4) $-2a$

(5) None of the above

Q.35. Glen spends a total of 9 hours writing a paper and finishing a project. He spends x hours on the paper and y hours finishing the project. Glen spends $1\frac{1}{2}$ more hours on the paper than he spends on the project. How many hours does Glen spends writing the paper?

(1) $3\frac{1}{4}$ hours

(2) $3\frac{3}{4}$ hours

(3) $5\frac{1}{4}$ hours

(4) $5\frac{3}{4}$ hours

(5) None of the above

Q.36. Assume $h(x) = f(g(x))$, where both f and g are differentiable functions.. If $g(-1) = 2$, $f(2) = -4$, $g'(-1) = 3$. What is $h'(-1)$?

(1) 6

(2) 8

(3) -12

(4) 12

(5) -10

Q.37. Evaluate $\int (lnx)^2 dx$

(1) $x(lnx)^2 - 2xlnx + c$

(2) $(lnx)^2 - 2xlnx + 2x + c$

(3) $x(lnx)^2 - 2xlnx + 2x + c$

(4) $x(lnx)^2 - 2lnx + 2x + c$

(5) None of the above

Q.38. Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5?

(1) 0.55

(2) 0.35

(3) 0.53

(4) 0.45

(5) 0.25

Q.39. The exam grades of 7 students are: 70, 66, 72, 96, 46, 90, 50. What is the sample standard deviation?

(1) 18.6

(2) 20.1

(3) 17.5

(4) 19.2

(5) 21.4

Q.40. In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green? (Answers have been rounded off to two decimal points)

(1) 0.33

(2) 0.75

(3) 0.37

(4) 0.38

(5) 0.43

SET II

Test III-A

TEST OF ECONOMICS

This test is designed to examine the candidate's abilities in basic microeconomics and macroeconomics.

Q.1. If a country allows trade and, for a certain good, the domestic price without trade is higher than the world price,

(1) the country will be an exporter of the good.

(2) the country will be an importer of the good.

(3) the country will be neither an exporter nor an importer of the good.

(4) Additional information is needed about demand to determine whether the country will be an exporter of the good, an importer of the good, or neither.

(5) None of the above

Q.2. When a country saves a larger portion of its GDP than it did before, it will have

(1) more capital and higher productivity.

(2) more capital and lower productivity.

(3) less capital and higher productivity.

(4) less capital and lower productivity.

(5) None of the above

Q.3. In the long run the unemployment rate equals

(1) zero.

(2) the cyclical rate of unemployment.

(3) the natural rate of unemployment.

(4) the sum of the cyclical and natural rate of unemployment.

(5) None of the above

Q.4. Suppose that more British decide to vacation in the U.S. and that the British purchase more U.S. Treasury bonds. Ignoring how payments are made for these purchases,

(1) the first action by itself raises U.S. net exports, the second action by itself raises U.S. net capital outflow.

(2) the first action by itself raises U.S. net exports, the second action by itself lowers U.S. net capital outflow.

(3) the first action by itself lowers U.S. net exports, the second action by itself raises U.S. net capital outflow.

(4) the first action by itself lowers U.S. net exports, the second action by itself lowers U.S. net capital outflow.

(5) None of the above

Q.5. Which of the following would cause the real exchange rate of the U.S. dollar to depreciate?

(1) the U.S. government budget deficit decreases

(2) capital flight from foreign countries

(3) the U.S. imposes import quotas

(4) the U.S. government budget deficit increases

(5) None of the above.

Q.6. Suppose the economy is in long-run equilibrium. In a short span of time, there is a sharp rise in the stock market, an increase in government purchases, an increase in the money supply and a decline in the value of the dollar. In the short run

(1) the price level and real GDP will both rise.

(2) the price level and real GDP will both fall.

(3) neither the price leave nor real GDP will change.

(4) All of the above are possible.

(5) None of the above is possible.

Q.7. Which of the following reduces the interest rate?

(1) an increase in government expenditures and an increase in the money supply

(2) an increase in government expenditures and a decrease in the money supply

(3) a decrease in government expenditures and an increase in the money supply

(4) a decrease in government expenditures and a decrease in the money supply

(5) None of the above.

Q.8. One important category of expenditure in national income accounting is investment. Consider the following events:

a. Rahul buys himself a 100year-old colonial era house.
b. Ritu builds herself a brand-new contemporary house.
c. Mukesh Ambani buys Rs 50 crore in Tata stock from Cyrus Mistry on the National Stock Exchange.
d. Hindustan Motors sells Rs10 crore in stock to the public and uses the proceeds to build a new car factory.

Which of these events will be counted as investment in India's national accounts?

(1) a and c
(2) b and d
(3) a and b
(4) c and d
(5) d only

Q.9. In an IS-LM framework, monetary policy is ineffective in increasing output in which of the following cases?

a. The IS curve is downward sloping and LM curve is upward sloping,
b. The IS curve is downward sloping and LM curve is vertical,
c. The IS curve is vertical and LM curve is upward sloping,
d. The IS curve is horizontal and the LM curve is upward sloping

(1) a
(2) b
(3) c
(4) d
(5) None of the above

Q.10. A stimulative fiscal policy combined with a restrictive monetary policy will necessarily cause which of the following:

a. Gross domestic product to increase
b. Gross domestic product to decrease
c. Interest rates to fall
d. Interest rates to rise
e. The government budget deficit to decrease

(1) a only
(2) d only
(3) d and e
(4) c only
(5) e only

Q.11. Consider a small open economy facing an unchanged world real interest rate. The government of this economy increases its purchases. Which of the following is ***true***?

a. National saving decreases.
b. National saving increases.
c. Investment remains the same.
d. Investment increases.

(1) a and c
(2) b and c
(3) a and d
(4) b and d
(5) d only

Q.12. The purchase of bonds by the Reserve Bank of India will have the greatest effect on real gross domestic product if which of the following situations exists in the economy?

a. The required reserve ratio is high, and the interest rate has a large effect on investment spending.
b. The required reserve ratio is high, and the interest rate has a small effect on investment spending.
c. The required reserve ratio is low, and the interest rate has a large effect on investment spending.
d. The required reserve ratio is low, and the marginal propensity to consume is low.
e. The marginal propensity to consume is high, and the interest rate has a small effect on investment spending.

(1) a and e
(2) only b
(3) b and e
(4) d and e
(5) c only

Q.13. Let's say the government of India prohibits the import of foreign cars. Which of the following is ***true***?

a. Real exchange rate depreciates.
b. Real exchange rate appreciates
c. Net exports remain unchanged.
d. Net exports increase

(1) a and c,
(2) a and d,
(3) b and d,
(4) b and c
(5) c only

Q.14. Which of the following policy options will lead to an increase in money supply?

a. The Reserve Bank of India reduces the reserve requirements on demand and time deposits of commercial banks.
b. The Reserve Bank of India buys Government Securities through open market operation.
c. The Reserve Bank of India sells Government Securities through open market operation.

(1) a only
(2) b only
(3) c only
(4) b and c
(5) a and b

Q.15. Consider a small open economy with perfect capital mobility and flexible exchange rates. Which of the following statements would be ***true***?

a. Expansionary monetary policy is effective
b. Increase in government expenditure leads to depreciation in domestic currency
c. Expansionary fiscal policy is effective
d. Increase in money supply leads to appreciation in domestic currency

(1) a and d,
(2) a only,
(3) b and c,
(4) c only,
(5) d only

Q.16. For the demand function $Q_d = 286 - 20p$, calculate price elasticity of demand at $p = 3, Q = 226.$

(1) 0.014
(2) 0.10
(3) 0.05
(4) 0.26
(5) 0.5

Q.17. Assume that utility function of a consumer is given by $U_i(x, y) = -(x-1)^2 - (y-1)^2.$

Prices of goods x, y are $p_x = p_y = 1$ and income earned $M = 10$.

Solve for the consumer's optimal bundle.

(1) $x^* = 1, y^* = 1$
(2) $x^* = 5, y^* = 5$
(3) $x^* = 1, y^* = 10$
(4) $x^* = 10, y^* = 0$
(5) $x^* = 0, y^* = 10$

Q.18. Given the production function $Q = \min\left\{\frac{K}{1}, \frac{L}{2}\right\}$ and prices of inputs of capital, K, and labour, L, $w = r = 1$, solve for the firm's optimal input bundle for producing output $Q = 10$.

(1) $K^* = 20, L^* = 10$

(2) $K^* = 10, L^* = 10$

(3) $K^* = 10, L^* = 0$

(4) $K^* = 10, L^* = 20$

(5) $K^* = 20, L^* = 20$

Q.19. (Third degree price discrimination) A monopolist is able to separate the demand for its product into two separate markets. The own-price demand curves for markets one and two are respectively $Q_1^D = 1000 - 4P$ and $Q_2^D = 1200 - 4P$. The total cost curve for the firm is given by: $SRTC = 100 + 0.25Q^2$, where $Q = Q_1 + Q_2$.

Find the quantity sold in each market assuming that the monopolist maximizes profits.

(1) $Q_1 = \frac{400}{3}, Q_2 = \frac{700}{3}.$

(2) $Q_1 = \frac{200}{3}, Q_2 = \frac{1100}{3}.$

(3) $Q_1 = \frac{500}{3}, Q_2 = \frac{1000}{3}.$

(4) $Q_1 = \frac{100}{3}, Q_2 = \frac{800}{3}.$

(5) $Q_1 = \frac{200}{3}, Q_2 = \frac{1300}{3}.$

Q.20. Find all the pure strategy Nash equilibrium or equilibria in the following simultaneous game, in which player 1 has three strategies, T, M, B, while player 2 has three strategies L, C and R. The payoff matrix is as follows:

		Player 2	
	L	C	R
Player 1 T	(2,0)	(1,1)	(4,2)
Player 1 M	(3,4)	(1,2)	(2,3)
Player 1 B	(1,3)	(0,2)	(3,0)

(1) (M, C) and (B, L)

(2) (T, L) and (B, C)

(3) Only (B, L)

(4) (B, R) and (M, R)

(5) (T, R) and (M, L)

Q.21. Each firm in a competitive market has a cost function of $C = 2q^2 + 10$. The market demand function is Q = 24 – p, while the market supply function is given by Q = 12 + 2p. Solve for the output chosen by each firm in order to maximize profit.

(1) $q^* = 10$

(2) $q^* = 20$

(3) $q^* = 1$

(4) $q^* = 4$

(5) $q^* = 15$

Q.22. Asa buys a painting. There's a 20% probability that the artist will become famous and the painting will be worth Rs 5000. There's a 5% probability that the painting will be destroyed in a fire or some other disaster. If the painting is not destroyed and the artist does not become famous, it will be worth Rs 400. What is the expected value of the painting?

(1) Rs 2500

(2) Rs 600

(3) Rs 1000

(4) Rs 1300

(5) Rs 1600

Q.23. Which of the following statements is/are true

A. If an economy is operating on its production possibilities frontier, it must produce less of one good if it produces more of another.
B. Points outside the production possibilities frontier are attainable but inefficient.
C. The production possibilities frontier is bowed outward because the trade-offs between the production of any two goods are constant.

(1) Only A
(2) Only B
(3) Only C
(4) A, B and C
(5) All are false

Q.24. If there is excess capacity in a production facility, it is likely that the firm's supply curve is

(1) Price inelastic
(2) None of these answers
(3) It could be anything, cannot say anything about it.
(4) Unit price elastic
(5) Price elastic

Q.25. Suppose that the price of a new bicycle is Rs.3000. A student values a new bicycle at Rs.4000. It costs Rs.2000 for the seller to produce the new bicycle. What is the value of total surplus if the student buys a new bicycle?

(1) Rs.5000
(2) Rs.3000
(3) Rs.4000
(4) Rs.2000
(5) Rs.1000

Q.26. Producer surplus is the area

(1) below the supply curve and above the price
(2) below the demand curve and above the supply curve
(3) below the demand curve and above the price
(4) above the demand curve and below the price
(5) above the supply and below price.

Q.27. When marginal costs are below average total costs,

(1) average fixed costs are rising
(2) average total costs are falling
(3) average total costs are rising
(4) average total costs are minimized
(5) None of the above

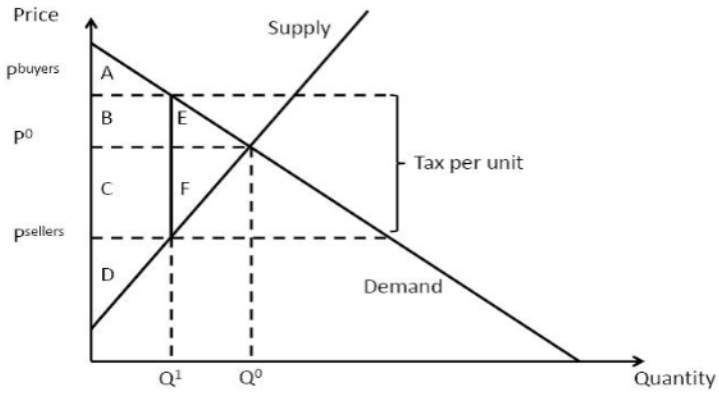
Q.28. For a price ceiling to be binding constraint to the market, the government needs to set it

(1) above the equilibrium price
(2) below the equilibrium price
(3) at the equilibrium price
(4) at any price
(5) there is not enough information to tell

Q.29. Compared to a perfectly competitive market, a monopoly market will usually generate

(1) Higher prices and lower output
(2) Higher prices and higher output
(3) Lower prices and lower output
(4) Lower prices and higher output
(5) Higher prices, but higher or lower output depending on efficiency of the monopolist

Q.30. Which of the following is true, based on the figure below



(1) The buyers pay a larger portion of the tax because demand is more inelastic than supply.
(2) The sellers pay a larger portion of the tax because supply is more elastic than demand.
(3) The buyers pay a larger portion of the tax because demand is more elastic than supply.
(4) The sellers pay a larger portion of the tax because supply is more inelastic than demand.
(5) None of the above

SET II

Test III-B

TEST OF ADVANCED MATHEMATICS

This test is designed to examine the candidate's abilities in advanced level mathematics.

Q.1. Let x and y be the sides of 2 squares respectively such that $y = x^2 + x$. Find the rate of change of the area of the second square with respect to area of first square.

(1) $2x^2 + 1$

(2) $2x^2 + 3x + 1$

(3) $3x^2 + 1$

(4) $2x^2 + 6x + 1$

(5) $2x^2 + 9x + 1$

Q.2. The function $f(x) = sinx + tanx - 2x$ is increasing in the interval ..?

(1) $(0, \pi)$

(2) $\left(0, \frac{\pi}{2}\right)$

(3) $\left(\frac{\pi}{2}, \pi\right)$

(4) $\left(\frac{\pi}{4}, \frac{\pi}{2}\right)$

(5) Other than the given options

Q.3. If Rolle's theorem holds for the function $y = x^3 + bx^2 + cx, x \in [1,2]$ at the point $x = \frac{4}{3}$ then the values of 'b' and 'c' are

(1) $b = 5 \; and \; c = -5$

(2) $b = -5 \; and \; c = -8$

(3) $b = -5 \; and \; c = 8$

(4) $b = 5 \; and \; c = 0$

(5) $b = 0 \; and \; c = -5$

Q.4. Let f and g have continuous first and second derivatives everywhere. If $f(x) \leq g(x)$ for all real x, which of the following must be true?

I. $f'(x) \leq g'(x)$ for all real x

II. $f''(x) \leq g''(x)$ for all real x

III. $\int_0^1 f(x)dx \leq \int_0^1 g(x)dx$

(1) I Only

(2) III Only

(3) I and II Only

(4) all I , II and III

(5) II Only

Q.5. $\lim_{x\to 0} \frac{1-\cos 4x}{1+\cos 3x} = ?$

(1) 0

(2) 1

(3) $\frac{-4}{3}$

(4) $\frac{-3}{4}$

(5) ∞

Q.6. Find the area of the region bounded by y = e^x, y = e^{-x} and the line x=2 ?

(1) $e^2 + e^{-2} - 2$

(2) $e^2 + e^{-2} + 2$

(3) $e + e^{-1} - 2$

(4) $e^2 - e^{-2} + 2$

(5) Other than the given options

Q.7. Let $y' = \frac{dy}{dx}$ and $y'' = \frac{d^2y}{dx^2}$. Then $y = ae^x + be^{-3x}$ is the solution of

(1) $y'' + y = 0$

(2) $y'' + xy = 0$

(3) $y'' + 2y' - 3y = 0$

(4) $y'' - 3y' + 2y = 0$

(5) $y'' + 2xy' = 0$

Q.8. Find the number of critical points of the function $f(x) = sin^2 x$ on the interval $[0,2\pi]$?

(1) 1

(2) 2

(3) 3

(4) 4

(5) None

Q.9. Find $lim_{x \to c} \frac{\sqrt{x}-\sqrt{c}}{x-c}$ for $c > 0$

(1) 0

(2) $2\sqrt{c}$

(3) c

(4) $\frac{1}{2\sqrt{c}}$

(5) 1

Q.10. The first derivative of a function is given by $f'(x) = \frac{x+1}{\sqrt{x^2+1}}$. Then the interval on which f is increasing is

(1) $(-1, \infty)$

(2) $(0, \infty)$

(3) $(-1, 1)$

(4) $(-\infty, 1)$

(5) $(-\infty, -1)$

Q.11. Express 20 as the sum of 2 positive numbers x and y such that $x^3 + y^2$ is as small as possible. The numbers x and y respectively are:

(1) 10, 10

(2) 1, 19

(3) $\frac{5}{2}, \frac{35}{2}$

(4) $\frac{10}{3}, \frac{50}{3}$

(5) Other than the given options

Q.12. A function $f(x)$ has the following properties: $f''(x) = 6x - 12$ and the graph of the curve $y = f(x)$ passes through the point (2,5) and has a horizontal tangent at that point. Then $f(x) = ?$

(1) $x^3 - 6x^2 + 12x - 3$

(2) $-x^3 + 6x^2 - 12x - 3$

(3) $6x^3 - 12x^2 + 6x - 1$

(4) $x^3 - 6x^2 - 12x - 3$

(5) Other than the given options

Q.13. If $\int_1^3 \frac{dx}{x^{1/2}+x^{3/2}} = \frac{\pi}{b}$, then the value of b = ?

(1) 1

(2) (2

(3) 3

(4) 4

(5) 6

Q.14. The sum of the series $\sum_{k=1}^{\infty} \frac{k(k+1)}{k!} 3^k$ = ?

(1) e

(2) e^3

(3) $3e^3$

(4) $9e^3$

(5) $15e^3$

Q.15. If $y = cos^{-1}\left(\frac{1-x}{2\sqrt{x}}\right)$. Then $\frac{dy}{dx}$ = ?

(1) $\frac{x}{1+\sqrt{x}}$

(2) $\frac{1}{\sqrt{x(1+x)}}$

(3) $\frac{1}{\sqrt{x(1-x)}}$

(4) $\frac{1}{(1+x)\sqrt{x}}$

(5) $\frac{x}{1-\sqrt{x}}$

Q.16. If $xe^{xy} = y + sin^2 x$, then what is the value of $\frac{dy}{dx}$ $at\ x = 0$?

(1) π

(2) 0

(3) 1

(4) -1

(5) Other than the given option

Q.17. If each pair of the equation $x^2 + ax + b = 0, x^2 + bx + c = 0\ and\ x^2 + cx + a = 0$ has one common root then the product of all common root is

(1) $\sqrt{abc}$

(2) $4\sqrt{abc}$

(3) $2\sqrt{abc}$

(4) $\sqrt{ab + bc + ca}$

(5) Other than the given options

Q.18. Evaluate $\int_0^a \int_0^x (x^2 + y^2) dy\, dx$

(1) $\frac{a^2}{2}$

(2) $\frac{a^3}{2}$

(3) $\frac{a^4}{4}$

(4) $\frac{a^4}{3}$

(5) None of the above

Q.19. Trapezoidal rule for evaluation of $\int_a^b y\, dx$ requires the interval $[a, b]$ to be divided into

(1) 2n-1 subintervals of equal width

(2) 2n+1 subintervals of equal width

(3) Any number of subintervals of equal width

(4) 2n subintervals of equal width

(5) Other than given options

Q.20. If the percentage error in volume of a sphere is 5%, then find the percentage error in its radius?

(1) 15

(2) 10

(3) 5

(4) 1.33

(5) 1.67

Q.21. If $\sin u = \frac{x^2+y^2}{x+y}$, then find $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$

(1) cos u

(2) tan u

(3) 1

(4) π

(5) sin u

Q.22. Find the derivative of $tan^{-1}\left(\frac{3x-x^3}{1-3x^2}\right)$ with respect to $tan^{-1}\left(\frac{2x}{1-x^2}\right)$

(1) 3/2

(2) 2/3

(3) 3x

(4) 2x

(5) tan x

Q.23. Find $\lim_{x\to 0} \frac{x+tanx}{sinx}$

(1) 1

(2) 2

(3) 0.5

(4) 0.25

(5) 0

Q.24. Find the distance between the foci of the hyperbola given that $x = 4\sec\theta \; and \; y = 4\tan\theta$.

(1) $\sqrt{2}$

(2) $2\sqrt{2}$

(3) $4\sqrt{2}$

(4) $8\sqrt{2}$

(5) Other than the given options

Q.25. A ball is dropped from a height of 15 feet. Each time it bounces, it rises four-fifths the vertical distance it previously fell. The total distance travelled by the balls is _____ feet.

(1) 90

(2) 135

(3) 120

(4) 105

(5) 75

Q.26. Let *T* be the linear operator on $\mathbb{R}^2$ defined by $T(x_1, x_2) = (x_1, 0)$. Then with respect to the basis $\{e_1, e_2\}$ of $\mathbb{R}^2$ where $e_1 = (1,0)$ and $e_2 = (0,1)$, T is of form

(1) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

(2) $\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$

(3) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

(4) $\begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}$

(5) $\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$

Q.27. Let $\{a_n\}$ and $\{b_n\}$ be two real sequences such that $a_n > 0, b_n > 0$ for all n. Suppose $\lim_{n\to\infty} a_n = a$ and $\lim_{n\to\infty} b_n = b$. Let $c_n = \frac{a_n}{b_n}$. Then

(1) $\{c_n\}$ does not converge to a limit

(2) $\{c_n\}$ converges only if $a > 0$

(3) $\{c_n\}$ converges only if $b > 0$

(4) $\{c_n\}$ converges only if $b = 0$

(5) $\{c_n\}$ converges only if $a = 0$

Q.28. Which one of the following vectors does not form a basis for $\mathbb{R}^3$?

(1) $a_1 = [3,0,2], a_2 = [7,0,9], a_3 = [4,1,2]$

(2) $a_1 = [1,1,0], a_2 = [3,0,1], a_3 = [5,2,1]$

(3) $a_1 = [1,0,4], a_2 = [2,0,8], a_3 = [7,1,8]$

(4) $a_1 = [1,5,7], a_2 = [4,0,6], a_3 = [1,0,0]$

(5) None of the above

Q.29. If $y = a\cos(\log x) + b\sin(\log x)$ then

(1) $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = 0$

(2) $x^2 \frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = 0$

(3) $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$

(4) $\frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = 0$

(5) $\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = 0$

Q.30. Which of the following statements is true?

(1) Every continuous function is integrable

(2) A function *f*, defined on $[-1,1]$ such as $f(x) = k, k > 0$ when $x \neq 0$ and zero otherwise is continuous but not integrable

(3) Every integrable function is continuous

(4) A function is integrable if and only if it is continuous

(5) A continuous function is differentiable everywhere

M.Sc SAMPLE QUESTIONS

SET II

ANSWER KEY

TEST-II:

TEST OF BASIC MATHEMATICS

Q.No.	Choice	Q.No.	Choice
Q.1	5	Q.21	1
Q.2	4	Q.22	1
Q.3	2	Q.23	3
Q.4	4	Q.24	2
Q.5	3	Q.25	3
Q.6	2	Q.26	1
Q.7	5	Q.27	2
Q.8	3	Q.28	4
Q.9	1	Q.29	2
Q.10	2	Q.30	2
Q.11	2	Q.31	4
Q.12	3	Q.32	4
Q.13	3	Q.33	4
Q.14	2	Q.34	1
Q.15	4	Q.35	3
Q.16	1	Q.36	3
Q.17	5	Q.37	3
Q.18	2	Q.38	4
Q.19	1	Q.39	1
Q.20	1	Q.40	1

TEST-III-A:

TEST OF ECONOMICS

Q.No.	Choice
Q.1	2
Q.2	1
Q.3	3
Q.4	2
Q.5	1
Q.6	1
Q.7	3
Q.8	2
Q.9	3
Q.10	2
Q.11	1
Q.12	5
Q.13	4
Q.14	5
Q.15	2
Q.16	4
Q.17	1
Q.18	4
Q.19	1
Q.20	5
Q.21	3
Q.22	4
Q.23	1
Q.24	5
Q.25	4
Q.26	3
Q.27	2
Q.28	2
Q.29	1
Q.30	4

TEST-III-B:

TEST OF ADVANCED MATHEMATICS

Q.No.	Choice
Q.1	2
Q.2	2
Q.3	3
Q.4	2
Q.5	1
Q.6	1
Q.7	3
Q.8	4
Q.9	4
Q.10	1
Q.11	4
Q.12	1
Q.13	5
Q.14	5
Q.15	4
Q.16	3
Q.17	1
Q.18	4
Q.19	3
Q.20	5
Q.21	2
Q.22	1
Q.23	2
Q.24	4
Q.25	4
Q.26	2
Q.27	3
Q.28	3
Q.29	3
Q.30	1