ST. JOSEPH'S COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

DEPARTMENT OF MATHEMATICS

SUBJECT CODE: AMBM401

SUBJECT NAME: MATHEMATICS FOR COMPETITIVE EXAMS

DEPARTMENT NAME: MATHEMATICS

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UNIT-I

PART-A

1. If A ={1,2,3,4}, B={2,4,5,6} and C={1,3,4,6,8} find AU(B∩C).
2. Write properties of Relation .
3. If A={1,2,3} then find all subsets of A.
4. If A={1,2,3} and B={ a, b} then find A X B and B X A
5. Define symmetric difference with example
6. Find AUB if A={2,4,5} and B={4,7,12,13,0}
7. Define domain with example
8. Show that (A U B) using venn diagram
9. Define subset.
10. Write De-Morgen's laws.
11. Prove that A U B = B U A using venn diagram.
12. Write Associative laws.
13. Define Relation.
14. Define Equivalence Relation.
15. Define one to one and onto functions.
16. If $f(x) = x^2+2x$ then find f(1).
17. Find Domain and Range R: A→B where A={0,1,2,3,7} and. B={-1,4,5,7,8}.

18. If $f(x) = x^2-3x+16$ find f(a).
19. If f(x) = 13x+22 then find F(x+h).
20. If $f(x) = 3^x$ then find f(1/2).

PART-B

1. If A ={1,3,4,5} and B ={1,7,8,10} then find A U B and A ∩ B.
2. Prove that A U (B U C) = (A U B) U C using venn diagram.
3. If A ={1,7.3} and B ={2,3,5} then find A U B and A ∩ B.
4. If U = {1,2,3,4,5,6,7,8,9,10}
   A = { 3,5,9,10}
   B ={2,3,5,8} then find I)A U B II) A ∩ B III)$A^{'}$.
5. State and prove distributive laws using venn diagram.
6. Find A X B X C if A ={1,2}, B={0,5} and C ={6,7}.
7. If A= {1,2,3} B={2,4} then find A XB and BXA.
8. Explain about properties of Relation.
9. Explain Cartesian product of two sets with example.
10. Find AxAxA where A = {1,2,3}.
11. Define one-one and onto function. Construct a function f:A→B which is one-one and onto where A ={x,y,z,l} and B ={1,2,3}.
12. Find f(0), f(1) where (i) $f(x) = 5x^2+8x-5$.
13. If $f(x) = x^2$ find $\frac{f(x+h)-f(x)}{h}$.
14. If $h(x) = 4x^3+2x-7$ find (i) h(2) (ii) h(1/2)
15. A market research group conducted a survey of 1000 consumers and reported that 730 consumers liked product A and 455 consumers liked product B.what is the least number that must have liked both products assuming that there may be consumers of products different from A and B.

PART-C

1. In a survey concering the smoking habits of consumers it was found that 55% smoke cigarette A, 50% smoke B, 42% smoke C, 28% smoke A and B, 20% smoke A and C, 12% smoke B and C and 10% smoke all the three cigarettes
   (i)what percentages do not smoke?
   (ii)what percentages of smoke exactly two brands of cigarettes?

2. Use venn diagram to verify De Morgan's law for a set difference.
3. If U = {0,1,2,3,4,5}, A ={1,3,5} and B ={0,5,2,4} verify De Morgan's laws.
4. Show that (i) $(A \cup B)' = A' \cap B'$ (ii) $(A \cap B)' = A' \cup B'$ using the venn diagram.
5. In a survey concerning the reading habits of students, it was found that 60% read magazine A,50% read magazine B,50%read magazine C,30% read A and B,20% read B and C,30% read A and C and 10% read all three.

(i)what percentage read exacted two magazines?

(i)what percentage do not read only of the three magazines?

6. show that (i) Associative (ii) distributive for both union and intersection using U ={0,1,2,3,4,5} A={1,3,5} , B={0,5,2,4}, C={2,5}.

7. A Company study of the product preferences of 10,000 consumers reported that each of the products A,B,C was liked by 5015,3465,4827 respectively and all the products were liked by 500 people,product A and B were liked by 850,product B and C were liked by 850 and product A and C were liked by 1420. Prove that the study results are not correct.it was found that ab error was nade in recording the number consumers liking the products A and C. What is the value of this number?

8. (I) If A={A,B,C} and B={1,2,3} Find AxB and BxA

(II) Give an examples if relation from A into B where A={1,2,3}

B={4,5,6,7}

9. If $f(x) = x^2-3x+16$ find (i)f(a) (ii)f(0) (iii)f(1) (iv)f(-2) (v)f(1/2) (vi)f(m)

10. If F(x)= 13x+22 find (I) f(a) (ii)f(x+h) (iii)$\frac{f(x+h)-f(x)}{h}$ (iv)f(1/2)

UNIT-II

PART-A

1. Write the formula for distance between two points.

2. If A(-3,3), B(5,9) find the distance between AB.
3. Find the mid-point of the line joining (-7,3) and (5,7).
4. Find the slope of the line joining P(-2,3) and Q(8,-5).
5. Find the slope of the line joining A(1,2) and B(7,9).
6. Write the formula for straight line quation.
7. Find the slope of the line segment connecting the points P(5,6) and Q(6,0).
8. Write the formula for two point form.
9. Define section formula.
10. Find the equation the line whose slope is 3/2 and which cut of 3 units along OY.
11. Define marginal cost and average cost.
12. Define linear Demand curve.
13. Define linear supply curve.
14. Define Break and Even point.
15. Write formula for Break Even point.

PART-B

1. If A(-3,3), B(1,2) and C(-7,4), find the distance between A and B; B and C.
2. If A(2,3), B(0,8) and C(-6,6), find the distance between A and B; B and C.
3. Find the slope of the line joining P(-2,3) ,Q(8,-5).
4. Find the equation of the line to slope 8/3 which cut of 5 units.
5. Find the equation of the straight line passing through the point (2,-3) having slope 5/7.
6. Find the equation of the straight line passing through the points A(-2,3) B(8,-5).
7. The total factory cost of making x units of a product is given by y=5x+300 and 75 units are made then find (i)fixed cost (ii)variable cost (iii) toatal cost.
8. 15 radius are sold ,when the price is 400 and 25 radio are sold when the price is 350. What is the equation of the demand curve assuming it to be linear.
9. When the price is Rs50,60 cameras of a particular type are available and when the price is Rs80,140 caneras of the same type available in the market. Determine the supply curve.
10. Plot the graph of the quadratic function $y=3x^2+4x+3$.

PART-C

1. Prove that the points (1,1),(-1,-1) and ($-\sqrt{3}$,$\sqrt{3}$)form an quilateral triangle.
2. Find the point which divedes the line joining A(2,3) & B(12,18) in the ratio 2:3.what is the midpiont of AB.
3. Find the ratio in which the join (-5,1) and (1,-3) divides the straight line passing through(3,4) and (7,8).
4. Show that the three points (4,2), (7,5) and (9,7) lie on the straight line.
5. A line passes through (-3,10) and its intercept on axis 8 then find the straight line quation.
6. A company estimates that when its sales is Rs 60,000 its variable expanse will be Rs 30,000 for a fixed expanse of Rs 10,000. Find the Break-even point. What is the profit when the sales is Rs 50,000?
7. A company expects fixed costs to be Rs 30,000 and variable cost to be Rs 42,000 when the sales will be Rs 60,000
   (i) Write down the equation relating sales and expanses.
   (ii) Find the break-even points.
8. Find the equilibrium price and quantity for the following Supply curve $y=x^2+5x+1$ and demand curve $y=9-2x^2$.
9. The demand and supply curves are given by $y=10-3x^2$ and $y=4+2x+x^2$(y represents the price and x represents the quantity).find the equilibrium price and quantity.
10. Find the quilibrium price and quantity from the following (i)supply curve $y=x^2+5x+1$ and demand curve $y=9-2x^2$.

UNIT-III

PART-A

1. Define limit.
2. Evaluate $\lim_{n\to\infty} \frac{n-2}{n+1}$
3. Evaluate $\lim_{x\to\infty} \frac{x+5}{2x+3}$
4. Define continuous function.
5. Define average concept and marginal concept.
6. Write the differential co-efficient

7. Let y=3x-6 then find the elasticity.
8. Let y=3x-6 then find the elasticity if x=8.
9. Explain about marginal revenue.
10. Define simple application of economics.

PART-B

1. Evaluate $\lim_{n\to\infty} \frac{2n^2+3n+5}{-5n^2+7n+9}$.
2. Evaluate $\lim_{x\to 0} \frac{5x^2-7x+9}{2x^2+3}$.
3. Evaluate $\lim_{h\to\infty} \frac{f(x+h)-f(x)}{h}$ where $f(x)=2x^2+5$.
4. Explain about differential co-efficient.
5. Find the elasticity if the demand curve is given by $qp^n=c$ where c and n are constants.
6. If $q=32-4p-p^2$ then find n when p=3.
7. Let y=3x-6 find (a) the elasticity (b) the elasticity if x=8.
8. Consider the function $f(x)=x^2$. Let Δx be the increment given to x and Δy be the corresponding increment in y= f(x).
9. Find the elascity the demand curve is given by q x p^n where c,n are constants.

PART-C

1. Evaluate $\lim_{n\to\infty} \frac{2n^2+3n+5}{-5n^2+7n+9}$ and Evaluate $\lim_{x\to 0} \frac{5x^2-7x+9}{2x^2+3}$.
2. For every value of x the quantity in kilograms, the price function is given by

$$Y = \begin{cases} 2.50x, 0 \le x \le 20 \\ 2.00x, 20 \le x \le 50 \\ 1.75, 50 \le x \le 100 \\ 1.50x, x > 100 \end{cases}$$

   (i)sketch the graph of the function
   (ii)find the point of discontinuity
3. The every cost of purchasing x units and is proportional to x within each order interval is given by

$$C = \begin{cases} 15x, 0 \le x \le 2000 \\ 13x, 2000 \le x \le 4000 \\ 10x, x > 4000 \end{cases}$$

(i)sketch the graph of the function

(ii)find the point of discontinuity.

4. If $q=32-4p-p^2$ then find n when p=3. Find marginal revenue.
5. If y=f(x) define the derivative y with respect to x.show that $d(x^{2)}/dx = 2x$.
6. Find the marginal revenue at price 6 units when the demand function given by $x= p^{0.2} e^{-0.3p}$.prove that MR is 0 when p=0 or p=4.
7. The total cost c of making x units of a product is $c=0.00003x^3-0.045x^2+8x+25{,}000$. Find theb marginal cost at 1000 units output.
8. If y=f(x) define the derivative y with respect to x.show that $d(x^2)/dx = 2x$.

UNIT-IV

PART-A

1. Define non-singular matrix.
2. If $A=\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$ and $B=\begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$ then find AB.
3. If $A=\begin{bmatrix} 2 & 0 & 9 \\ -1 & 6 & 11 \\ 4 & 8 & -4 \end{bmatrix}$ And $B=\begin{bmatrix} 1 & 2 & 3 \\ -1 & 0 & 0 \\ 1 & -1 & -4 \end{bmatrix}$ then find A+B.
4. If $A=\begin{bmatrix} 4 & 10 & 9 \\ -1 & 6 & 11 \\ 4 & 4 & 6 \end{bmatrix}$ And $B=\begin{bmatrix} 12 & 8 & 3 \\ -1 & 0 & 0 \\ 1 & -7 & -4 \end{bmatrix}$ then find A+2B.
5. Let $A=\begin{bmatrix} -3 & 7 \\ 4 & -5 \end{bmatrix}$ then find AI.
6. Let $A=\begin{bmatrix} 3 & 2 \\ 3 & 3 \end{bmatrix}$ and $C=\begin{bmatrix} 1 & -2/3 \\ -1 & 1 \end{bmatrix}$ Find CA.
7. Multify $\begin{bmatrix} 2 & 3 & 4 \\ 1 & 5 & 6 \end{bmatrix}\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$.
8. Write down the following equations in the matrix form 2x+3y=6, 7x-5y=11.
9. Write the communtative property.
10. If $A=\begin{bmatrix} 2 & 3 \\ 4 & 7 \end{bmatrix}$ then find A^T.

11.Write the inverse matrix.

12.If A=$\begin{bmatrix}2 & 2\\3 & 5\end{bmatrix}$ find $|A|$.

13.If A=$\begin{bmatrix}5 & -3\\-2 & 2\end{bmatrix}$ find adj A.

14.Write grammer's rule.

15.Explain about solution of a system of linear equation.

PART-B

1. If A=$\begin{bmatrix}4 & -1 & 0\\-3 & 5 & -6\\2 & -7 & 8\end{bmatrix}$ And B=$\begin{bmatrix}-1 & 0 & 1\\5 & -2 & 2\\3 & 4 & 3\end{bmatrix}$ then find A+B and A-B.
2. If A=$\begin{bmatrix}2 & 3\\-1 & 4\end{bmatrix}$ and B=$\begin{bmatrix}5 & -2\\-1 & 6\end{bmatrix}$ and C=$\begin{bmatrix}0 & 2\\1 & -3\end{bmatrix}$ find A+B = B+A.
3. If A=$\begin{bmatrix}2 & -1 & 4\\6 & 2 & 8\\0 & 2 & -1\\3 & -4 & 5\end{bmatrix}$ and B=$\begin{bmatrix}4 & 1 & 0 & 8\\-1 & 6 & 2 & 1\\2 & -7 & -1 & 4\end{bmatrix}$ find AB.
4. If A=$\begin{bmatrix}2 & 3\\-1 & 4\end{bmatrix}$ and B=$\begin{bmatrix}5 & -2\\-1 & 6\end{bmatrix}$ and C=$\begin{bmatrix}0 & 2\\1 & -3\end{bmatrix}$ show that asssociative property on addition.
5. If A=$\begin{bmatrix}1 & -1 & 1\\2 & 0 & 1\end{bmatrix}$, B=$\begin{bmatrix}1 & -1 & 0\\0 & 1 & -1\\1 & -1 & 1\end{bmatrix}$ and C=$\begin{bmatrix}1 & 0\\0 & 1\\1 & 1\end{bmatrix}$ Tthen find (AB)C.
6. If A=$\begin{bmatrix}2 & 3\\4 & 7\end{bmatrix}$ and B=$\begin{bmatrix}0 & 3\\1 & 2\end{bmatrix}$ then prove that $(AB)^T=B^T A^T$.
7. Show that A=$\begin{bmatrix}1 & 2 & 2\\2 & 1 & 2\\2 & 2 & 1\end{bmatrix}$ satisfies the quation A^2-4A-5I=0.
8. Find the inverseof A=$\begin{bmatrix}2 & 2\\3 & 5\end{bmatrix}$
9. Find the inverseof A=$\begin{bmatrix}2 & 1\\2 & -2\end{bmatrix}$.
10. Find the adjoint of the matrix A=$\begin{bmatrix}5 & 3 & 7\\3 & 26 & 2\\7 & 2 & 11\end{bmatrix}$.

PART-C

1. If A=$\begin{bmatrix} 2 & 3 \\ -1 & 4 \end{bmatrix}$ and B=$\begin{bmatrix} 5 & -2 \\ -1 & 6 \end{bmatrix}$ and C=$\begin{bmatrix} 0 & 2 \\ 1 & -3 \end{bmatrix}$ show that communtative and asssociative property on addition.
2. If A=$\begin{bmatrix} 2 & 3 & -4 \\ 6 & 7 & 8 \end{bmatrix}$,B=$\begin{bmatrix} 6 & -3 & 2 \\ 5 & 0 & 8 \end{bmatrix}$, $C = \begin{bmatrix} 1 & 2 & -3 \\ 5 & -4 & 3 \end{bmatrix}$ find (a) A+B-C (b)A-B+C (c) A+B=B+A.
3. If A=$\begin{bmatrix} 2 & 3 \\ -1 & 4 \end{bmatrix}$ and B=$\begin{bmatrix} 5 & -2 \\ -1 & 6 \end{bmatrix}$ then show that (i) (A+B)' = A'+B' (ii) (A-B)' = A'-B'.
4. Show that =$\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ satisfies the quation A^2-4A-5I=0.
5. If A=$\begin{bmatrix} 1 & 6 & 5 \\ 2 & 4 & 3 \\ 6 & 1 & 2 \end{bmatrix}$ B=$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$ C=$\begin{bmatrix} 1 & 8 & 4 \\ 2 & 3 & 4 \\ 1 & 2 & 3 \end{bmatrix}$ Find (I) 2A+B-C (II)A+B+6C.
6. If A=$\begin{bmatrix} 2 & 3 \\ -1 & 4 \end{bmatrix}$ and B=$\begin{bmatrix} 5 & -2 \\ -1 & 6 \end{bmatrix}$ then show that $(AB)^T=B^T A^T$.
7. Find the inverse of A=$\begin{bmatrix} 4 & 0 & 2 \\ 2 & 10 & 2 \\ 3 & 9 & 1 \end{bmatrix}$.
8. Solve $2x_1+3x_2-x_3=9$, $x_1+x_2+x_3=9$, $3x_1-x_2-x_3=-1$ using matrix inverse technique.
9. Solve 3x-y+2z-8=0,x+y+z-2=0, 2x+y-z+1=0 by using crammer's rule.
10. Solve $2x_1+3x_2-x_3=9$, $x_1+x_2+x_3=9$, $3x_1-x_2-x_3=-1$.
11. Consider an economy of two industries P and Q where the data,in millions of rupees is given below:

User	P	Q	Final demand	Total out-put
P	14	6	8	28
Q	7	18	11	36

Determine the out-put if the final demand changes to 20 for P and 30 for Q.

12. In an economy of three industries A,B,C the data is given below

User	A	B	C	Final demand	Total out-put

A	80	100	100	40	320
B	80	200	60	60	400
C	80	100	100	20	300

Determine the out-put if the final demand changes to (i) 10 for A,40 for B, 20 for C. (II)60 for A,40 for B, 60 for C.

UNIT-V

PART-A

1. Express the following as percentage (i)0.37 & (ii)1.37.
2. Express the following as decimal (i) 5% (ii) 47.34%.
3. Express 31.57% as decimal.
4. A state leviies 12% sales tax.find the tax on a car listed at Rs.42,000.
5. Find 150% of Rs 32,500.
6. Find the invoice price if the list price is Rs750 with a trade discount of 30%.
7. Define simple interest.
8. Calculate (a) the ordinary simple interest (b) the exact simple interest for Rs500 for 80 days at 6% per annum.
9. Calculate the compound interest for Rs2500 for 4years at 8% per annum.
10. The sum of two whole numbers is 25 and their difference is 5.find the numbers.

PART-B

1. A buys an article for Rs 40 and sells it for Rs65.express his profit as a percentage of the cost price.
2. Calculate the total interest on Rs420 for 50days, Rs325 for 63 days and Rs 743 for 82days at 5% per annum.
3. Find the invoice price if the list price is Rs1500 with trade discounts 30% and 10%.
4. Calculate (a) the ordinary simple interest (b) the exact simple interest for Rs500 for 80 days at 6% per annum.
5. Find the interest value of Rs2000 due in 8 months at 12% simple interest.

6. A sells electrical fans at Rs300 per price.for each 24 fans purchased one fan is given free and his profit is 20%. Find the cost price.
7. Find the sum of the series between 200 and 400 divisible by 7.
8. Find the sum up to 'n' terms of the series 6+66+666+6666…
9. Express 0.0444… as a fraction.
10. The sum of two numbers is 25 and their difference is 5.find the numbers.

PART-C

1. Two firms A and B have the same list price for an item. A offers discounts of 25% and 15% and B offers discounts of 20%, 10% and 10%. Which is the more advantageous to the purchaser?
2. A dealer got a profit of 20% by selling an article for Rs72. But he wants to make a profits of 35%. What should be his new selling price.
3. A discount of 10% on cash sales and 3% on credit sales is given by a dealer who had listed his articles 25% higher than the actual cost. If 3/5 of his stock were sold on cash sales find the percentage of his gross profit.
4. A person borrowed a sum of rupees 3,500 on the condition to repay in 23 monthly instalments of Rs 150 and the last instatement of Rs 50. Calculate the simple interest at the rate of 5% per annum. Which he has to pay as the 25^{th} instalment.
5. A man has Rs1000 to his credit in his account on 1^{st} january. The bank allows interest 4% per annum, which is calculated on 30^{th} june and 31^{st} december and changes ¼ % commision for collecting and paying cheques. At the end of each month the bank collected cheques to the value Rs400 for account holder and paid out of a total of Rs.300. find the sum in his account on 30^{th} june.
6. Find the sum of all the numbers divisible by 9 between 200 and 500.
7. Find the up to 'n' terms of the series. 6+66+666+6666+…

8. The cost of accountancy book, one commerce book and one economics book is Rs20. The cost of one accountancy, two commerce and the economics books is Rs 38 and the cost of three accountancy, three commerce and the economics books is Rs 55. Find the cost of each book.
9. Solve $3x-7y+2z=23$

   $2x+5y-z=-11$

   $X+3y+5z=10$.
10. The sum of the cost of two different radios A and B is Rs 800. A is sold at a profit of 12% and B on a loss of 6%. The nrt profit in the sale is Rs 33. Find the price of each radio.