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1B1N240136 (Pages : 2) Reg. No:.............................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Degree Examination, November 2024

MAT1CJ101 – Differential Calculus

(FYUGP 2024 Admission)

Time: 2 hours Max. Marks : 70

Course Outcome Mapping Scheme

1	2	3	4	5	6	7	8	9	10
CO3	CO1	CO1	CO1	CO1	CO1	CO2	CO2	CO3	CO1
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
CO3	CO1	CO1	CO1	CO2	CO2	CO2	CO3	CO3	CO1

PART – A
All questions can be attended.
Each question carries Three mark.
Ceiling -24 Marks

1. Graph the circle $x^2 + y^2 + 4x - 4y + 4 = 0$.
2. Explain why the limit $\lim_{x\to 0} \frac{x}{|x|}$ doesn't exist.
3. Calculate $\lim_{x\to 9} \frac{\sqrt{x}-3}{x-9}$.
4. For what value of a is $f(x) = \begin{cases} x^2 - 1, & x < 3 \\ 2ax, & x \geq 3 \end{cases}$ continuous for every x?
5. Determine the horizontal tangents of the curve $y = x^3 - 3x^2 + 2$.
6. Differentiate the function $y = \sin(x - \cos x)$.
7. Determine the absolute maximum value of the function $f(x) = 2x^2 - 4x + 3$ on the interval [-1,2].
8. Determine the function $f(x)$ whose derivative is $2x$ and $f(1)=0$.
9. Analyze whether the graph of the function $f(x) = x^3 - 3x$ has an inflection point.
10. Calculate $\lim_{x\to -\infty} \frac{-4x^3+7x}{x^2-x+10}$.

PART – B

All questions can be attended.
Each question carries six marks.
Ceiling -36 Marks

11. Give an equation for the shifted graph of $y = 3x^2$ up 3 and right 3 units. Then sketch the original and shifted graphs together.
12. Analyze whether the function $y = \sin\left({}^{1}/_{x}\right)$ has a limit as x approaches 0.
13. Show that the equation $x^3 - 15x + 1 = 0$ has 3 solutions in the interval $[-4,4]$.
14. Determine tangent and normal to the curve $x^2 - xy + y^2 = 7$ at the point $(1,1)$.
15. Apply the Mean Value Theorem to show that functions with same derivative differ by a constant.
16. Determine the intervals where the graph of the function $f(x) = x^3 - 3x \quad + 3$ is increasing or decreasing. Identify the local extreme values.
17. Apply second derivative test to identify the local extreme values of the function $f(x) = x^4 - 8x^2 + 16$.
18. Analyze limits and find asymptotes to the curve $y = \frac{2x^2+3x-1}{x^2-1}$.

PART - C

Answer any *one* questions.
Each question carries Ten marks.

19. Analyze critical points and inflection points and sketch the graph of the function $y = (x-2)^3 + 1$.
20. (a)Determine the derivative of $f(x) = 4 - x^2$ using the definition of derivatives.
    (b)Prove that if f has a derivative at x = c, then f is continuous at x = c.
    (c)If f is continuous at x=c, does it imply that f has a derivative at x=c? Justify.

1 x 10 = 10 Marks

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1B1N240141 (Pages : 4) Reg. No:........................
Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Degree Examination, November 2024

MAT1FM105(2) –Mathematics For Competitive Examinations Part – 1

(FYUGP 2024 Admission)

Time: 1.5 hours Max. Marks : 50

Answer all questions. Each question carries One mark.

1. The least number, which must be added to 6709 to make it exactly divisible by 9, is
   (a) 7 (b) 2 (c) 5 (d) 4
2. Which one of the following is the largest prime number of three digits
   (a) 997 (b) 999 (c) 991 (d) 993
3. What is the unit's digit in the product $(264)^{153} \times (66666)^{72}$?
   (a) 6 (b) 4 (c) 1 (d) 2
4. A boy was asked to multiply a number by 25 but by mistake he multiplied by 45 and the answer was 200 more than the correct answer. What was the number?
   (a) 7 (b) 8 (c) 10 (d) 12
5. The sum of first n odd natural numbers is be given by;
   (a) $(n+1)^2$ (b) $n^2 + 1$ (c) n^2 (d) $n^2 - 1$
6. In the sequence $7, 14, 28, \ldots$, what will be the 10^{th} term?
   (a) 3584 (b) 4682 (c) 3764 (d) 4600
7. Find out the wrong number in the given sequence of numbers.
   22, 33, 66, 99, 121, 279, 594
   (a) 33 (b) 121 (c) 279 (d) 594
8. Which of the following is the largest of all?
   (i) 7/8 (ii) 15/16 (iii) 23/24 (iv) 31/32
   (a) (i) (b) (ii) (c) (iii) (d) (iv)
9. A fraction become 4 when 1 added to both numerator and denominator, and when it be becomes 7, when 1 subtracted from both numerator and denominator. Then the numerator of the fraction is?
   (a) 2 (b) 3 (c) 15 (d) 7
10. The value of $0.\overline{3421}$ is
    (a) $\frac{3421}{10000}$ (b) $\frac{3421}{9,999}$ (c) $\frac{3421}{9999}$ (d) None of these
11. The LCM of three number is 120. Which of the following cannot be their HCF
    (a) 8 (b) 12 (c) 24 (d) 35

12. The LCM of two numbers is 48. If the ratio of the two number is 2:3, then the sum of the number is

(a) 28 (b) 32 (c) 40 (d) 64

13. The HCF of $\frac{2}{3}, \frac{8}{9}, \frac{64}{81}$, and $\frac{10}{27}$ is:

(a) $\frac{2}{3}$ (b) $\frac{2}{81}$ (c) $\frac{16}{81}$ (d) $\frac{160}{81}$

14. Find the least number which when multiplied with 74088 will make it a perfect square.

(a) 42 (b) 44 (c) 46 (d) 48

15. The cube root of .000216 is:

(a) 0.6 (b) 0.06 (c) 77 (d) 87

16. The Simplification of $\frac{0.8\times0.8\times0.8-0.5\times0.5\times0.5}{0.8\times0.8+0.8\times0.5+0.5\times0.5}$ gives

(a)0.8 (b) 0.4 (c) 0.3 (d) 0.13

17. How many $\frac{1}{8}$'s are there in $37\frac{1}{2}$?

(a) 300 (b) 400 (c) 500 (d) cannot be determined

18. If out of 10 selected students for an examination, 3 were of 20 years age, 4 of 21 and 3 of 22 years, the average age of the group is:

(a) 22 years (b) 21 years (c) 21.5 years (d) 20 years

19. What is the average of the first six odd numbers each of which is divisible by 7 ?

(a) 42 (b) 43 (c) 47 (d) 49

20. 10 typists can type 600 pages in 8 hours. Find the average number of pages typed by each typist in an hour.

(a)7 pages (b) 7.5 pages (c) 8 pages (d) 8.5 pages

21. Average age of a group of 30 boys is 16 years. A boy of age 19 leaves the group and a new boy joins the group. If the new average age of the group is 15.8 years, find the age of the new boy.

(a)12 years (b) 13 years (c) 14 years (d) 15 years

22. Seats for Mathematics, Physics and Biology in a school are in the ratio 5 : 7 : 8. There is a proposal to increase these seats by 40%, 50% and 75% respectively. What will be the ratio of increased seats?

(a) 2 : 3 : 4 (b) 6 : 7 : 8 (c) 6 : 8 : 9 (d) None of these

23. Two numbers are in the ratio of 4: 5 and the sum of these numbers is 27. Find the numbers

(a) 13, 14 (b) 12, 15 (c) 9, 18 (d) 3, 24

24. If 0.75 : x :: 5 : 8, then x is equal to:

(a) 1.12 (b) 1.2 (c) 1.25 (d) 1.30

25. Present ages of Sameer and Anand are in the ratio of 5 : 4 respectively. Three years hence, the ratio of their ages will become 11 : 9 respectively. What is Anand's present age in years?

(a) 24 (b)27 (c) 40 (d) Cannot be determined

26. The sum of ages of 5 children born at the intervals of 3 years each is 50 years. What is the age of the youngest child?

(a) 4 years (b) 8 years (c) 10 years (d) None of these

27. If $45 \times y = 35\% \, of \, 900$ then y is .....

(a)6 (b) 7 (c) 9 (d) 4

28. If 40% of an amount is 250, what will be 60% of that amount?

(a) 300 (b) 320 (c) 375 (d) 400

29. 1200 boys and 800 girls appeared in an examination. If 60% of the boys and 40% of the girls passed the examination, what is the percentage of candidates who failed in the examination?

(a)48 % (b) 52 % (c) 45 % (d) 42 %

30. Ramesh bought a chair for Rs. 1540 and sold it to Suresh. If Ramesh earned a profit of 25%, find the selling price of chair.

(a) Rs.1875 (b) Rs.1900 (c) Rs.1925 (d) Rs.1950

31. A shopkeeper sold an article for Rs. 2500. If the cost price of that article is 2000. Find the profit percent.

(a) 23% (b) 25% (c) 27% (d) 29%

32. By selling a property for Rs. 45000 aperson incurs a loss of 10%. Find the selling price to gain the profit of 15%

(a)55000 (b) 60000 (c) 57500 (d) 58000

33. A true discount on a bill of 2700 is Rs 200. What is the banker's discount?

(a) Rs. 210 (b) Rs.212 (c) Rs. 216 (d) Rs. 218

34. A banker's gain of a certain sum due 2 years hence at 10% per annum is Rs. 26. Find the present worth.

(a) Rs. 450 (b) Rs. 550 (c) Rs. 650 (d) Rs.780

35. A moneylender charged Rs. 180 as simple interest on a sum of Rs. 600 for four months. What is the rate of interest per annum.

(a)80% (b) 85% (c) 90% (d) 95%

36. In how many years the simple interest on Rs. 6000 at 10% rate of simple interest become Rs.1800

(a) 3 years (b) 3.5 years (c) 4 years (d) 4.5 years

37. What is the compound interest on Rs. 2500 for 2 years at rate of interest 4% per annum?

(a)Rs. 180 (b) Rs. 204 (c) Rs. 210 (d) Rs. 220

38. On lending a certain sum of money on C.I. one gets Rs.9050 in 2 years and Rs.9500 in 3 years. What is the rate of interest?

(a)5% (b) 4.5% (c) 5.5 % (d) 6%

39. If 5 men can colour 50 – meterlong cloth in 5 days, in many days 4 men can colour a 40-meter long cloth?

(a)5 days (b) 6 days (c) 4 days (d) 3 days

40. A can do a job in 30 days. B alone can do the same job in 20 days. If A starts the work and joined by B after 10 days, in how many days the job will be done?

(a)15 days (b) 16 days (c) 17 days (d) 18 days

41. A jogger is running at a speed of 15 km/hr. In what time he will cross a track of length 400 meters?

(a) 96 sec. (b) 100 sec. (c) 104 sec. (d) 110 sec.

42. A man walking at a speed of 8 km/hr covers a certain distance in 1 hour 45 minutes. If he runs at a speed of 10 km/hr, in what time he will cover the same distance?

(a) 74 minutes (b) 70 minutes (c) 80 minutes (d) 84 minutes

43. A train crosses a pole in 20 sec. If the length of train is 500 meters, what is the speed of the train?

(a) 27 m/s (b) 20 m/s (c) 25 m/s (d) 30 m/s

44. A train of length 200 meters is moving at a speed of 80 km/hr. In what time it will cross a man who is running at 10 km/hr in opposite direction of the train?

(a)11 seconds (b) 9 seconds (c) 7 seconds (d) 8 seconds

45. A man rows downstream at 20 km/hr and rows upstream at 15 km/hr. At what speed he can row in still water?

(a) 17.5 km/hr (b) 18 km/hr (c) 20.5 km/hr (d) 22 km/hr

46. A man can row a boat at a speed of 20 km/hr in still water. If the speed of the stream is 5 km/hr, in what time he can row a distance of 75 km downstream?

(a) 1.5 hours (b) 2 hours (c) 2.5 hours (d) 3 hours

47. At what time between 5 and $6'O$ clock are the hands of a clock together?

(a) $27\frac{3}{11}$ minutes past 5 o clock (b) $15\frac{3}{11}$ minutes past 5 o clock

(c) $10\frac{3}{11}$ minutes past 5 o clock (d) 5 minutes past 5 o clock

48. If the hands of the clock are inclined at 15 minutes past 5, then what was the angle of the hands?

$(a)59\frac{1}{2}^0$ (b)65^0 (c) $66\frac{1}{2}^0$ (d) $67\frac{1}{2}^0$

49. Which year among these not a leap year

(a) 1996 (b) 1868 (c)1998 (d) 1884

50. If today is Friday, then what will be the day after 363 days.

(a) Sunday (b) Saturday (c) Thursday (d) None of these

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1B1N240137 (Pages : 2) Reg. No:............................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester Degree Examination, November 2024

MAT1MN101 –Calculus

(FYUGP 2024 Admission)

Time: 2 hours Max. Marks : 70

Course Outcome Mapping Scheme

1	2	3	4	5	6	7	8	9	10
CO1	CO1	CO1	CO2	CO2	CO2	CO3	CO3	CO3	CO3
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
CO1	CO1	CO2	CO2	CO3	CO3	CO2	CO3	CO3	CO3

PART – A
All questions can be attended.
Each question carries Three marks.
Ceiling -24 Marks

1. Discover the points where the graph of the function $y = 2x^3 + x$ has a horizontal tangent.
2. Write the derivative of $y = x^3(\sqrt{x} + 1)$
3. Determine $\frac{dy}{dx}$ at the point $\left(\frac{\pi}{4}, \pi\right)$, If $\sin y + \cos 2x = 2y$
4. Using the linear approximation of $f(x) = \sqrt{x}$ at $a = 4$, Estimate $\sqrt{3.9}$.
5. Determine the intervals where the function $f(x) = x^2 - x$ is increasing and where it is decreasing.
6. Apply Rolle's theorem to the function $y = x^3$ for x in $[-1,1]$.
7. Find $\int \sin^3 x . \cos x \, dx$
8. Calculate $\sum_{k=1}^{10} 3k(2k^2 + 1)$
9. Determine $\frac{d}{dx}\left(\int_x^3 \sqrt{1 + t^2}\, dt\right)$
10. Write an equation for finding the volume of the solid has the shape of a washer with outer radius $g(x)$ and inner radius $f(x)$.

PART – B

All questions can be attended.
Each question carries six marks.
Ceiling -36 Marks

11. Examine the differentiability of the function $f(x) = |x|$ at $x = 0$.
12. At a distance of 12,000 feet from the launch site, a spectator is observing a rocket being launched vertically. Calculate the speed of the rocket at the instant when the distance of the rocket from the spectator is 13,000 ft and is increasing at the rate of 480 ft/sec
13. Determine the extreme values of the function $f(x) = 3x^4 - 4x^3 - 8$ on$[-1,2]$.
14. Determine an equation of the tangent line to the graph of $y = \frac{5x}{x^2+1}$ at $x = 1$.
15. Identify the function given that its derivative is $f'(x) = x.\sqrt{x^2+1}$ and that its graph passes through the point $(0,1)$.
16. Compute the Riemann sum for $f(x) = 2x - 3$ on $[0,2]$, using four subintervals and choosing the evaluation points to be the mid-point of the subintervals.
17. (a) Determine $\int_{-1}^{2} 3\, dx$, by using the geometrical interpretation.

    (b) Apply the Mean Value theorem for integral to the function $f(x) = 4 - 2x$ on the interval $[0,2]$.
18. Calculate the area of the region bounded by the graphs of $x = y^2$ and $y = x - 2$.

PART - C

Answer any *one* questions.
Each question carries Ten marks.

19. Analyze the critical points and inflection points and sketch the graph of the function $y = \frac{x^2}{x^2-1}$.
20. (a) Determine the volume of the solid obtained by revolving the region bounded by $y = \sqrt{x}$ and $y = x$ about the X-axis.

    (b) Calculate the area of the surface obtained by revolving the graph of $y = \sqrt{x}$ on the interval$[0,2]$ about the X-axis.

1 x 10 = 10 Marks

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1B1N240138 (Pages : 2) Reg. No:.........................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Degree Examination, November 2024

MAT1MN102 –Calculus of Single Variable

(FYUGP 2024 Admission)

Time: 2 hours Max. Marks : 70

Course Outcome Mapping Scheme

1	2	3	4	5	6	7	8	9	10
CO1	CO1	CO1	CO2	CO2	CO2	CO2	CO2	CO3	CO3
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
CO1	CO1	CO2	CO2	CO2	CO2	CO3	CO3	CO2	CO3

PART – A
All questions can be attended.
Each question carries Three marks.
Ceiling -24 Marks

1. Compute $\lim_{x\to 3}\left(\frac{x^2-2x}{x-2}\right)$.
2. Determine $\lim_{x\to\infty}\left(\frac{5x^2-4x}{2x^2+3}\right)$.
3. Show that $f(x) = |x|$ is continuous everywhere.
4. Determine $y'(x)$ if $y = \frac{x^3-4x^2+2}{x^2+1}$ by applying quotient rule.
5. Determine the points where the graph of $y = x^3 - 3x + 4$ have horizontal tangent line?
6. Compute $\frac{dy}{dx}$ if $y = \sqrt[3]{3x^8 + 21}$ at $x = 1$.
7. Determine $\frac{dy}{dx}$if $y = 2^{3x}$.
8. Compute $\frac{dy}{dx}$if $y = e^x + \sin^{-1}(3x)$.
9. Determine the intervals on which the function $f(x) = (2x+1)^3$ is concave up.
10. Analyze the inflection points of the function $f(x) = x^3 - 3x^2 + 2x$.

PART – B

All questions can be attended.
Each question carries Six marks.
Ceiling -36 Marks

11. Analyze the continuity of the function $g(x) = \begin{cases} 4x - 10, & x \neq 4 \\ -6, & x = 4 \end{cases}$.

12. Let $f(x) = \begin{cases} x - 2 & x < 0 \\ x^2 & 0 \leq x \leq 2 \\ 2x & x > 2 \end{cases}$. Calculate $\lim_{x\to 0} f(x)$ and $\lim_{x\to 2} f(x)$.

13. Let $H(x) = \frac{f(x)}{g(x)}$. Given that $f(1) = -1,\ f'(1) = 2,\ g(1) = 3$ and $g'(1) = -1$.

    Calculate $H'(1)$.

14. Determine the derivative of the following a) $\frac{1+\cos x^2}{1-\cos x^2}$ b) $\frac{9x^4 + \tan x}{4x^5+8e^x}$.

15. Apply implicit differentiation to find $\frac{dy}{dx}$ if $2xy - y^2 = 3$.

16. Determine the equation of the tangent line to the graph of $y = \ln x$ at $x = e^2$.

17. Apply First and Second derivative test to show that the function $f(x) = 3x^2 - 6x + 1$ has a relative minimum at $x = 1$.

18. Analyze all critical points of the function $f(x) = x^2(x-1)^{\frac{2}{3}}$.

PART - C

Answer any *one* question.
Each question carries Ten marks.

19. (a) Find $\lim_{x\to\frac{\pi}{4}} (1 - \tan x) \sec 2x$.

    (b) Find the derivative of $y = \left(\frac{(x^2-5)^{\frac{1}{3}}\sqrt{x^2+1}}{x^2-3x+4}\right)$ using logarithmic differentiation.

20. Analyze the locations of the intercepts, relative extrema and inflection points and sketch the graph of the polynomial $p(x) = 2x^3 - 6x + 4$.

1 x 10 = 10 Marks

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Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Degree Examination, November 2024

MAT1MN103 – Basic Calculus

(FYUGP 2024 Admission)

Time: 2 hours

Max. Marks : 70

Course Outcome Mapping Scheme

1	2	3	4	5	6	7	8	9	10
CO3	CO1	CO1	CO1	CO1	CO1	CO2	CO2	CO3	CO1
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
CO3	CO1	CO1	CO1	CO2	CO2	CO2	CO3	CO3	CO1

PART – A

All questions can be answered.
Each question carries Three marks.
Ceiling -24 Marks

1. Determine whether the function $f(x) = x^3 - x$ is even, odd, or neither.

2. Show that $f(x) = \frac{1}{x}$ and $g(x) = \frac{1}{x}$ are inverse functions.

3. Find the limit $\lim_{x \to 0} \frac{\tan x}{x}$.

4. Find the constant 'a' such that the function is continuous on the entire real number line,

$$f(x) = \begin{cases} \frac{x^2 - a^2}{x - a}, & x \neq a \\ 8, & x = a \end{cases}.$$

5. Find the derivative of the function $f(x) = x^2$ using the definition.

6. Differentiate $f(x) = e^{x^2}$.

7. Find the extrema of $f(x) = x^3 - \frac{3}{2}x^2$ on the interval $[-1, 2]$.

8. Find the two x-intercepts of the function $f(x) = x^2 - x - 2$ and show that $f'(x) = 0$ at some point between the two x-intercepts.

9. Find $\int_{-2}^{2} \sqrt{4 - x^2}\, dx$.

10. Find the area of the region bounded by the graph of

$$y = \frac{1}{x}$$

the x-axis, and the vertical lines $x = 1$ and $x = e$.

(Ceiling: 24 marks)

PART – B

All questions can be answered.
Each question carries Six marks.
Ceiling -36 Marks

11. Determine whether the function $f(x) = \sqrt{9 - x^2}$ is one-to-one. If it is, find its inverse function.

12. Find the limit $\lim_{x \to 2} \frac{x^2 + 2x - 8}{x^2 - x - 2}$.

13. Find the tangent line to the graph of $x^2 + y^2 = 1$ at the point $(0, 1)$.

14. Determine whether the function $f(x) = \begin{cases} x^2 + 1, & x \leq 2 \\ 4x - 3, & x > 2 \end{cases}$ is differentiable or not at $x = 2$.

15. Find the open intervals on which $f(x) = x^3 - \frac{3}{2}x^2$ is increasing or decreasing.

16. Determine the points of inflection and discuss the concavity of the graph of $f(x) = x^4 - 4x^3$.

17. Evaluate the definite integral by the limit definition.

$$\int_{-1}^{1} x^3 dx.$$

18. A ball is thrown upward with an initial velocity of 64 feet per second from an initial height of 80 feet.
    (a) Find the position function giving the height s as a function of the time t.
    (b) When does the ball hit the ground?

PART - C

Answer any one question.
Each question carries Ten marks.

19. Analyze and sketch the graph of

$$f(x) = \frac{\cos x}{1 + \sin x}.$$

20. (a) Find the derivative of $F(x) = \int_{\pi/2}^{x^3} \cos t dt$.
    (b) A chemical flows into a storage tank at a rate of $(180 + 3t)$ liters per minute, where t is the time in minutes and $0 \leq t \leq 60$. Find the amount of the chemical that flows into the tank during the first 20 minutes.

1 x 10 = 10 Marks

67

1B1N240140 (Pages : 3) Reg. No:.........................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Degree Examination, November 2024

MAT1MN104 –Mathematical Logic, Set Theory and Combinatorics

(FYUGP 2024 Admission)

Time: 2 hours Max. Marks : 70

Course Outcome Mapping Scheme

1	2	3	4	5	6	7	8	9	10
CO2	CO1	CO1	CO1	CO2	CO2	CO3	CO3	CO3	CO3
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20(a)**
CO3	CO1	CO1	CO2	CO2	CO3	CO3	CO3	CO3	CO2

PART – A

All questions can be attended.
Each question carries Three marks.
Ceiling -24 Marks

1. Let $A = \{x\}$, $B = \{y, z\}$, and $C = \{1,2,3\}$. Compute $A \times B \times C$
2. Evaluate each Boolean expression, where a = 3, b = 5, and c = 6.

   (1) $[\sim (a > b)] \wedge (b < c)$ (2) $\sim [(a \leq b) \vee (b > c)]$
3. Differentiate between conjunction and disjunction of two propositions using their truth table.
4. Rewrite each proposition symbolically, *where UD* - Set of real numbers.

   (1) For each integer *x*, there exists an integer *y* such that $x + y = 0$.

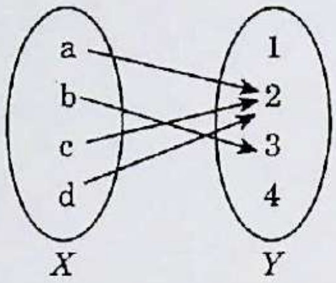
   (2) There exists an integer *x* such that $x + y = y$ for every integer *y*.
5. Let A ={a, b, c, d, g}, B = {b, c, d, e, f}, and C = {b, c, e, g, h}. Determine

   (a) $A \cup (B \cap C)$

   (b) $(A \cup B) \cap (A \cup C)$
6. Construct a partition of the set S = {a, b, c, d, e, f, g, h, i}
7. Let $A = \begin{bmatrix} 1 & 0 & -1 \\ 0 & 2 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 0 & -2 & 5 \\ 0 & 0 & 1 \end{bmatrix}$ and $C = \begin{bmatrix} -3 & 0 & 0 \\ 0 & 1 & 2 \end{bmatrix}$, Determine

   (a) A – B (b) B+C (c) A+2C

8. Determine whether or not the assignments in Figures 1 and 2 are functions.



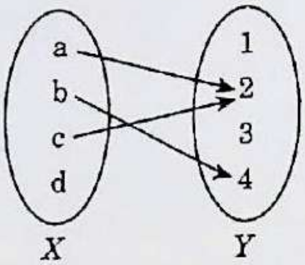


Figure 1 Figure 2

9. One type of automobile license plate number in Massachusetts consists of one letter and five digits. Compute the number of such license plate numbers possible.

10. Show that a set S with n elements has 2^n subsets.

PART – B
All questions can be attended.
Each question carries Six marks.
Ceiling -36 Marks

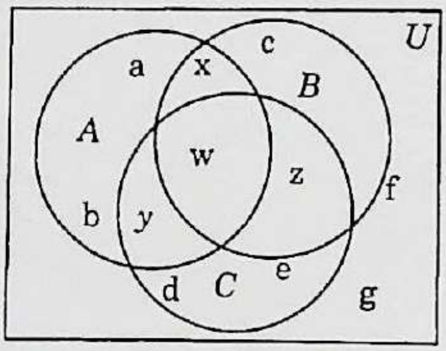
11. Five marbles are drawn at random from a bag of seven green marbles and four red marbles. Compute the probability that three are green and two are red.

12. Test $p \rightarrow q \equiv \sim q \rightarrow \sim p$; that is, an implication is logically equivalent to its contra-positive.

13. Analyzing the laws of logic simplify the boolean expression $(p \wedge \sim q) \vee q \vee (\sim p \wedge q)$.

14. Using the Venn diagram shown in the figure, determine each set.

(a) $(A \cup B) \cap C$ (b) $A \cap (B \cup C)$



15. Sketch the Venn diagrams of the following.

(a) $A - B$ (b) $A \oplus B$ (c) $(A \cup B)'$

16. Let $A = \begin{bmatrix} 1 & -2 & 3 \\ 0 & 4 & -1 \end{bmatrix}$ $B = \begin{bmatrix} 3 & -2 \\ 0 & 1 \\ -1 & 0 \end{bmatrix}$

Determine AB and BA, if defined.

17. Compute the number of positive integers ≤ 2076 and divisible by 3, 5, or 7.

18. Compute the number of permutations; that is, 3-permutations of the elements of the set $\{a, b, c\}$.

PART - C

Answer any *one* question.
Each question carries Ten marks.

19. (a) Explain Inclusion - Exclusion Principle in probability.

(b) A survey among 50 housewives about the two laundry detergents *Lex* (L) and *Rex* (R) shows that 25 like *Lex*, 30 like *Rex*, 10 like both, and 5 like neither. A housewife is selected at random from the group surveyed. Compute the probability that she likes neither *Lex* nor *Rex*.

20. (a) A survey among 100 students shows that of the three ice cream flavours vanilla, chocolate, and strawberry, 50 students like vanilla, 43 like chocolate,28 like strawberry, 13 like vanilla and chocolate, 11 like chocolate and strawberry, 12 like strawberry and vanilla, and 5 like all of them. Find the number of students surveyed who like each of the following flavours.

(1) Chocolate but not strawberry.

(2) Chocolate and strawberry, but not vanilla.

(3) Vanilla or chocolate, but not strawberry.

(b) Applying set laws, verify that $(X - Y) - Z = X - (Y \cup Z)$.

1 x 10 = 10 Marks