

Register Number:

Date:

**ST. JOSEPH’S COLLEGE (AUTONOMOUS), BANGALORE -27**

**B.C.A I SEMESTER**

**SEMESTER EXAMINATION: OCTOBER 2021**

**(Exam conducted in January –March 2022)**

 **CA 1321 – Mathematical Foundation**

**Time – 3 hours Max Marks-100**

**Part A**

I. **Answer all the Following 1\*20= 20**

1. Which of the Following is True?
2. P ^ (~ P) = t
3. P v (~ P) = f
4. P→ q = q→ p
5. P →q = (~q) →(~p)
6. P →(~P v Q) is false then value of P and Q are respectively.
7. F, F
8. F, T
9. T, T
10. T, F
11. Which of the following are Tautologies?
12. (P v Q) ^Q ↔Q
13. ((P VQ) ^~ P) → Q
14. ((P VQ) ^~ P) → P
15. Both a and b
16. Let P: I am in Bangalore;

 Q: I Love Cricket,

Then Q → P (Q → P) is?

1. If I love Cricket, then I am in Bangalore.
2. If I am in Bangalore, then I love Cricket.
3. I am not in Bangalore.
4. I love Cricket.
5. What is the Cartesian product of A = {1, 2} and B= { a, b}
6. {(1,a) (1,b) (2,a) (b,b)}
7. {(1,1) (2,2) (a,a) (b,b)}
8. {(1,a) (2,a) (1,b) (2,b)}
9. {(1,1) (a,a) (2,a) (1,b)}
10. If A and B are two sets , then A ∩( A U B) equals
11. A
12. B
13. Null Set
14. A ∩B
15. If n (A) = 20 and n (B) = 30 and n( A U B) = 40 then n( A ∩ B ) is
16. 20
17. 30
18. 40
19. 10
20. Which of the following is also refereed as an injective function?
21. Many to one
22. Onto
23. One to one
24. None of the mentioned.
25. If A is a square matrix of order 3 with |A| = 4 then find |2A|
26. 12
27. 32
28. 16
29. None of these
30. If A is a square matrix of order 3 and then |A| = 4 then |Adj A|
31. 4
32. 12
33. 16
34. 64
35. If A is any square Matrix of order n , then A (Adj A) is equal to
36. |A|I
37. I
38. 0
39. None of these
40. If A and B are Matrices, then Which from the following is true?
41. AB ≠ BA
42. T ≠ A
43. A+ B ≠ B+A
44. All are true.
45. The rank of the matrix $\left[\begin{matrix}1&1&1\\1&-1&0\\1&1&1\end{matrix}\right]$ is
46. 0
47. 1
48. 2
49. 3
50. The rank of Matrix can be found by
51. Normal form of a matrix
52. Echelon form of Matrix
53. Ad joint method
54. Both a and b
55. The characteristics equation of the matrix $\left[\begin{matrix}3&1&1\\-1&5&-1\\1&-1&3\end{matrix}\right]$ is
56. λ 3 – 11 λ 2 + 38 λ- 40 = 0
57. λ 3 – 11 λ 2 + 38 λ+ 40 = 0
58. λ 3 + 11 λ 2 + 38 λ+ 40 = 0
59. λ 3 + 11 λ 2 + 38 λ- 40 = 0
60. If the characteristics equation for matrix A is λ 3 – 2 λ 2 + λ = 0 then the eigen values of the matrix is
61. 0, 1 , 1
62. 0, -1, -1
63. 0, 2, 2
64. None of these
65. Evaluate $\lim\_{x\to 4}\frac{x2-16}{x-4}$

a.0

b.1

c.8

d. 16

1. Evaluate $\lim\_{x\to 4} x2+3x-4$
2. 24
3. 26
4. 28
5. 30
6. Find 5 sinx + 4 sec x
7. secx cotx
8. –cosecx secx
9. secx tanx
10. –cosec 2 x sec 2 x
11. Find $\frac{d2y}{dx2}=Sinx$
12. cosx
13. cotx
14. tanx
15. –sinx

**Part B**

**II. Answer Any Six of the following 6\* 6 = 36**

1. Solve ~ ( P v ( Q ^ R)) ↔ (( P v Q ) ^ ( P v R ))
2. Prove De’ Morgan’s Law.
3. Let X, Y, Z be any 3 sets find out X= {1, 2, 3} y = {2, 3, 4} Z= {3, 4, 5}
4. X- (X U Z) = (X – Y) ∩ (X – Z)
5. X- (Y ∩ Z) = (X – Y) U (X – Z)
6. Explain with an example the properties of a transpose of a matrix.
7. Find the inverse of a matrix A

A= $\left[\begin{matrix}12&18&48\\2&2&4\\-6&-9&-27\end{matrix}\right]$

1. Find the Rank of the matrix

$$\left[\begin{matrix}0&1&2&3&4\\0&0&2&2&2\\1&1&0&1&1\\3&3&2&1&3\end{matrix}\right]$$

1. a. $\frac{\lim\_{x\to 4}\frac{1}{\sqrt{x}}-\frac{1}{2}}{ X-4 }$ (4)

b.$ \lim\_{x\to 5}x 2+2x-4 $ (2)

1. a. h(y) = y – 4 - 9 y -3 + 8 y -2 + 12 Find $\frac{d2y}{dx2}$ (4)
2. g(Z) = 10 tanZ -2 cot Z (2)

**Part C**

**III. Answer Any THREE of the following 3 \* 8= 24**

1. a. Solve using PDNF (6)

(P ^ Q) V (~ P ^ R) V (Q ^ R)

 b.Prove Distributive law (2)

 P V ( Q ^ R ) ≡ ( P V Q) ^ ( P V R)

1. a. Explain the different types of Relation with an examples. (6)

 b.What is surjective Function (2)

 31. Use Cramer’s Rule

 4x- y+ z = 12

 2x + 2y +3z = 1

 5x – 2y + 6z = 22

32.Verify Cayley Hamilton theorem and also find A -1



33. a. solve using first order differential equation (5)

 Y = 20 + 5 $\sqrt{x}$ secx

 b. Solve using dy/ dx = x 2 Sinx (3)

**Part D**

**IV. Answer any TWO of the following 2\*10 = 20**

34. a. Prove the Quantifier $∀x\left((P\left(x\right)∧Q\left(X) )≡∀x (P\left(x\right)∧Q\left(X) \right)\right)\right)$ (5)

 b. g( x) = $\frac{x+2}{2}$ ; f (x) = $\frac{2x2+1}{3}$ (5)

 find fog (x) and gof(x) ; check whether it is communicative property.

35. a. A = $\left[\begin{matrix}2&0&1\\2&1&3\\1&-1&0\end{matrix}\right]$ find the value of A 2 – 3 A + 2 I (5)

 b. Reduce the following Matrix to Normal Form $\left[\begin{matrix}0&2&4&-4\\4&0&2&6\\2&1&3&1\end{matrix}\right]$ (5)

36. Find the Maximum and Minimum from f( x) = 2 x 3 – 6 x 2 + 6x + 5