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N18072

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

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Degree Examination, November 2018

BMAT1C01– Mathematics

(2017 Admission onwards)

Max. Time: 3 hours

Max. Marks : 80

Part –A

Answer all questions. Each carries one mark

1. If n(A) =2 and n(B)=3, then power set of A×B has .... number of elements.
2. A={2,4,6,8} , B={1,2,3,4,5,6} and U= {1,2.......50}.Then $A\cap B^C$ =................
3. Define relation on a set.
4. $\lim_{x\to 1}\frac{x^3+4x^2-3}{x^2+5}$
5. F(x)= [x], the greatest integer function is continuous at ....
6. Find dr/dα at $\alpha=\sqrt{3}$ if r= 1-$\frac{1}{\alpha}$.
7. Find the critical points of f(x)= x^4-x^3+10.
8. Evaluate $g^{'}(2)$ if g(2)= $\frac{1}{(t+2)^2}$
9. Explain linearization of f(x) at x=a
10. $\lim_{x\to 2} f(x)$ =a, then $\lim_{y\to 2} f(y)$ =......
11. If A=∅ ,then $(A\cap B)^C$= ....
12. Vertical asymptotes of y= $\frac{x+1}{3x+2}$

(12 x 1 = 12 Marks)

PART –B

Answer any seven questions. Each carries two marks

13. Check whether the relation R defined in the set {1,2,3,4,5,6} as R ={(a,b): b=a+1} is transitive?
14. Prove that $(A\cap B)^C$ =A^C UB^C
15. Evaluate $\lim_{x\to 3}\frac{x^3-27}{x^2-9}$
16. Define continuity of a function at a point
17. Find dy/dx if y= $\frac{\sqrt{x}}{sinx}$
18. Find the slop of the tangent of the curve y=x^3-3x at (3,2)
19. Find the rate of change of area of a circle with respect to the radius.
20. Find the critical points of the curve y= $x^{-1/3}$(x+2)
21. $\lim_{x\to\infty}\frac{x^2-2x+3}{3x^2-2x}$.

(7 x 2 = 14 Marks)

PART –C

Answer any six questions. Each carries five marks

22. Let A is the set of even numbers less that 10, B is the set of prime numbers less than 10 and U is the set of natural numbers less than 10. Find (A-B)× (B∩A^C).
23. Define an equivalence relation with an example.
24. F(x)=$\frac{(x+3)[x+2]}{x+2}$, Where [x] is the greatest integer function.
    Find$\lim_{x\to 2^+} f(x)$ and $\lim_{x\to 2^-} f(x)$.
25. If f(x)=$\sqrt{(1+x)}$,L=1,x_0 =0, ∈= 0.1. Find an open interval containing x_0 and a value of $\delta > 0$ such that 0< Ix $-x_0$I implies I f(x)-L I<∈.
26. The curve y=x^2+ax-b and y = cx+x^2 have common tangent at the point (-1,0).Find a,b and c.
27. Find the area of the region enclosed by the parabola y=2-x^2 and the line y= -x.
28. Discuss the continuity of the function f(x)=xsin(1/x) if x≠ 0 , f(0) =0.
29. Find dy/dx if y=$\frac{(x^2+1)(x+3)^{1/3}}{(x-2)^{\frac{3}{2}}(x^2-3)}$.

(6 x 5 = 30 Marks)

PART –D

Answer any three questions. Each carries eight marks

30. (a) State mean value theorem.
    (b)Verify mean value theorem for f(x)= $\sqrt{(x^2-4)}$ in [2,3]
    (c) Find the interval in which f(x)=x^3-6x^2+5x-2 increasing and decreasing.
31. Evaluate (a) $\lim_{x\to 0}(\frac{1}{x^2}$-$cot^2$x) (b)) $\lim_{x\to 0}(1+sinx)^{cotx}$
32. Sketch the graph of the function y= 6x/(3+x^2).
33. (a)Find the volume of the solid lies between the plane perpendicular to x –axis ,x=-1 and x=1. The cross sections perpendicular to x-axis are circular disks whose diameter run from the parabola y=x^2 to the parabola y=2-x^2.
    (b) Find the derivative of f(x)=(x-1)(x-2)(x-3).
34. Let R_1 and R_2 be relations on a set A represented by the matrices $MR_1=\begin{bmatrix}1&1&0\\0&0&1\\1&1&0\end{bmatrix}$ and

    $MR_2=\begin{bmatrix}0&1&1\\1&0&0\\0&0&1\end{bmatrix}$. Find the matrices which represent (a) $R_1 \cap R_2$ (b) $R_1 \cup R_2$ andR1oR2.

    Is this relations an equivalence relation?

(3 x 8 = 24 Marks)

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BMAT1B01– Foundations of Mathematics

(2016 Admission onwards)

Max. Time: 3 hours Max. Marks : 80

PART-A

Answer all questions. Each question carries *one* mark

1. A relation R on a set A is said to be anti symmetric if --------
2. Write the dual of $(A \cap U)^C \cap A = \emptyset$
3. $(A \cap B)^C =$ --------
4. The graph of $y = f(x-a)$ is the graph of $y = f(x)$ shifted ---------
5. $\lim_{x \to 2} \sqrt{(4x^2-3)}$.
6. $\lim_{x \to 0^-} \frac{1}{x} =$ ---------
7. The truth value of the statement $\exists x(x^3 = -1)$ the domain consists of all real numbers is -------
8. Write the converse of the statement, ' If today is Thursday then I have a test Today' .
9. The contra positive of $p \to q$ is---------
10. If $f(x) = \frac{x^3-1}{x-1}$,then $f(1) =$ --------
11. $-10 \pmod 3 =$ --------
12. The graph of an odd function is symmetric about--------

(12 x 1 = 12)

PART-B

Answer any *seven* questions. Each question carries *two* marks

13. If $A_i = \{1,2,3,\ldots,i\}$, $i = 1,2,3,\ldots$ find $\bigcup_{i=1}^{n} A_i$ and $\bigcap_{i=1}^{n} A_i$.
14. Define a partial order relation on a set and give an example.
15. If $A = \{a,b,c\}$,find the power set of A .
16. Find the domain and range of the function $g(z) = \sqrt{4 - z^2}$.
17. Find the center and radius of the circle $x^2+y^2+4x-4y+4 = 0$.
18. Find $\lim_{h \to 0^+} \frac{\sqrt{h^2+4h+5}-\sqrt{5}}{h}$.
19. If p is the proposition "You drive over 65 miles per hour" and q is the proposition "You get a speeding ticket", write the proposition "You drive over 65 miles per hour, but You do not get a speeding ticket" using p, q and logical connectives.
20. Let $Q(x, y)$ denote the statement "$x = y + 2$". What are the truth values of propositions $Q(1,2)$ and $Q(2,0)$
21. Express the statement "Every student in this class has studied Calculus" as a universal quantification.

(7x 2 = 14)

PART- C

Answer any *six* questions. Each question carries *five* marks.

22 Let A be a set of nonzero integers and let '$\approx$' be the relation on A×A defined as (a,b) $\approx$(c,d) whenever ad = bc. Prove that '$\approx$' is an equivalence relation.

23. Let A = {1,2,3,… ,14,15}. Let R be the equivalence relation on A defined by congruence modulo 4. Then
   (a) Find the equivalence classes determined by R.

   (b) Find a system B of equivalence class representatives which are multiples of 3.

24. For each $m \in P$, where P is the set of positive integers,let $A_m = \{m, 2m, 3m, ...\}$. Then find $(a)\ A_2 \cap A_7$
   $(b) A_6 \cap A_8$ $(c) A_3 \cup A_{12}$ $(d) A_3 \cap A_{12}$ $(e)\ A_3 \cap A_5$.

25. Given $\lim_{x\to c} f(x) = L$ and $\lim_{x\to c} g(x) = M$, Prove that $\lim_{x\to c}[f(x) + g(x)] = L + M$.

26. State Sandwich theorem for limit of functions. If $\lim_{x\to c}|f(x)| = 0$, show that $\lim_{x\to c} f(x) = 0$.

27. Show that $f(x) = \frac{x^2+x-6}{x^2-4}$ is not continuous at x= 2, but has a continuous extension to x= 2 and find that extension.

28. Show that $\neg(p \vee q)$ and $\neg p \wedge \neg q$ are logically equivalent.

29. Show that $\neg(p\to q) \to \neg q$ is a tautology using truth table.

(6 x 5 = 30)

PART D

Answer any *three* questions. Each question carries *eight* marks

30. Consider the function f: A→ B and g: $B \to C$. Prove the following
   a) If f and g are one to one then so is gof.
   b) If f and g are onto then so is gof.

31. Let B and $\{A_i\}$ with i $\in I$ be subsets of a universal set U. Then prove the following,
   a) $B \cap (\cup\{A_i\}) = \cap\{B \cup A_i\}$
   b) $(\cup\{A_i\})^C = \cap\{A_i^c\}$ and $(\cap\{A_i\})^C = \cup\{A_i^c\}$.

32. Let R be the relation on the set P of positive integers defined by the equation $x + 3y = 12$
   (a) Write R as a set of ordered pairs
   (b) Find the domain and the range of R
   (c) Find R^{-1}
   (d) Find the relation RoR

33. Show that the set Q of rational numbers is denumerable

34. a) $p \wedge (q \vee r) \Leftrightarrow (p \wedge q) \vee (p \wedge r)$
   b) $\neg p \to (p \to q)$ is a Tautology
   c) $p \to q$ and $\neg p \vee q$ are logically equivalent.

(3 x 8 = 24)