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(Pages : 4) 2020

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Reg. No. : ....

Name : ....

First Semester B.Sc. Degree Examination, August 2021

Career Related First Degree Programme Under CBCSS

Mathematics

Complementary Course I for Computer Science

MM 1131.10 : CALCULUS AND NUMBER THEORY

(2020 Admission Regular)

Time : 3 Hours

Max. Marks : 80

SECTION – I

(All the **first ten** questions are compulsory. They carry 1 mark each)

1. What is the natural domain of $\sinh^{-1} x$?

2. Write the equation of a hanging cable.

3. Determine whether the statement is true or false: The equation sinh x = cosh x has no solutions.

4. What is the n^{th} derivative of e^{2x}?

5. State fundamental theorem of calculus.

6. Write the complementary function of $(D^2 + 4D - 12)\,y = e^{3x}$.

7. Find the particular integral of $(D^2 + 5D + 6)y = e^x$.

8. Write the value of Euler function $\phi(n)$ for a prime number n.

P.T.O.

9. State Wilsons Theorem.

10. State Fermat's theorem.

(10 × 1

SECTION – II

Answ

32.

(Answer **any eight** questions from among the questions 11 to 26. Ea
carries **2** marks.

11. Draw the graph of the function $f(x) = \cosh x$.

80

12. Find the curve which is represented by the parametric
$x = \cosh\ t, y = \sinh\ t(-\infty < t < +\infty)$.

13. Find the n^{th} derivative of $\sin(ax+b)$

33

14. Use Leibnitz theorem to find the fourth derivative of x^2e^{4x}.

15. Evaluate : $\int \frac{3x^2}{1+x^3}dx$.

16. Evaluate the integral $\int \frac{x-1}{(x+1)(x-2)}dx$.

17. Find the total area between the curve $y^2 = x$ and the x axis ove
interval [1,4].

18. Find the arch length of the curve $y = x^{3/2}$ extending from origin to (1,1).

19. Verily that y_p is a solution of the given differential ec
$y'' - y = 8e^{-3x}, y_p = e^{-3x}$.

20. Solve $\frac{d^3y}{dx^3} + y = 0$.

21. Write the general form of a Euler – Cauchy differential equation of order 3.

22. Solve $\frac{d^2y}{dx^2} = xe^x$.

23. State Euclid's algorithm.

24. Find a number 'x' which satisfies $x \equiv 5 \pmod 8$ and $x \equiv 3 \pmod 7$.

25. Find the number of integers less than 500 and prime to it.

26. Prove that $n^7 - n$ is divisible by 42.

(8 × 2 = 16 Marks)

SECTION – III

Answer **any six** questions from among the questions 27 to 38. **These** question carry **4** marks.

27. Prove that $\ln(\cosh x + \sinh x) + \ln(\cosh x - \sinh x) = 0$.

28. If $y = e^{-x^2}$, prove that $y_1 + 2xy$ and hence show that $y_{n+1} + 2xy_n + 2ny_{n-1} = 0$ for $n \geq 1$.

29. Evaluate $\lim_{x \to \infty} \frac{\cosh x}{e^x}$.

30. Find the length from an antenna tower has the equation $3y = 4x^{3/2}$ from $x = 0$ to $x = 20$ meters. Find the length of the cable.

31. Find the area of the surface generated by revolving the curve $y = \sqrt{9 - y^2}, -2 \leq y \leq 2$.

32. Find the area of the region enclosed by $x = y^2$ and $y = x$.

33. Solve the equation $(D^2 - 4D + 4)y = e^{3x} + \cos 2x$.

34. Solve $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 2x + x^2$.

35. Find the number and the sum of divisors of 4116.

36. Find the highest power of a prime number 7 which divides 900!.

37. Prove that $16^{99} \equiv 1 (\text{mod } 437)$.

38. Show that 18! + 1 is divisible by 23.

(6 × 4 = 24 Ma

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SECTION – IV

Answer **any two** questions from among the questions 39 to 44. These qu... **15** marks.

39. (a) Prove that $\cosh^{-1} x = \ln\left(x + \sqrt{(x^2 - 1)}\right)$

(b) For the function $y(x) = x^2 e^x$, by applying Leibnitz theorem, prov... $y_n = \frac{1}{2} n(n-1)\, y_2 - n(n-2)\, y_1 + \frac{1}{2}(n-1)(n-2) y$.

40. (a) Evaluate $\int_0^{\pi/2} \cos^2 x \, dx$

(b) Evaluate $\int_0^1 \frac{x}{\sqrt{4 - 3x^2}} dx$.

41. (a) Using integration find the area of the region bounded by the triangle whose vertices are (1,0), (2,2) and (3,1).

(b) Find the volume of the solid that results when the region enclosed the curves $f(x) = \sin x$ and $g(x) = \cos x$ is revolved about the x-axis from $x = 0$ to $x = \pi / 4$.

42. Find the complete solution of $\left(D^2 + 4D + 5\right) y = e^{2x} + \cos 4x + x^3$.

43. (a) Solve $(1+x)^2 \frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = 4 \cos\log(1+x)$.

(b) Solve : $\frac{d^2x}{dt^2} - 3x - 4y = 0; \frac{d^2y}{dt^2} + x + y = 0$.

44. (a) Using Euclidean algorithm. find the gcd of 2210 and 493.

(b) If p is prime, then prove that $\phi\ (p^r) = p^r(1 - 1/p)$. Also prove that the sum of integers less than n and prime to it is equal $\frac{1}{2} n\phi(n)$ for $n \geq 2$.

(2 × 15 = 30 Marks)

B.Sc(CS) 2013, 2015 to 2018.

(Pages : 4)

L – 3933

Reg. No. : ....

Name : ....

First Semester B.Sc. Degree Examination, August 2021

Career Related First Degree Programme under CBCSS

Mathematics

Complementary Course for Computer Science

MM 1131.10 MATHEMATICS - I

(2013, 2015-2018 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – I

All the **first** questions are compulsory. Each question carries **1** mark.

1. Differentiate $\sin^{-1} x$.

2. Find $\frac{d\log(\cosh x)}{dx}$.

3. Differentiate $\frac{de^{\sinh^2 x}}{dx}$.

4. Find the partial derivative $\frac{\partial(\sin(xy))}{\partial x}$.

5. State Lagrange's mean value Theorem.

6. Find $\mathcal{L}\{0\}$.

7. Solve $e^{y}\left(\frac{dy}{dx}+1\right)=\cos x$.

8. Define Prime Numbers and Composite Numbers.

9. Show that $a \equiv a(\bmod n)$.

10. Find the principal amplitude of $-1-i$.

SECTION – II

Answer any **eight** questions among the questions **11** to **22**. They carry **2** marks each.

11. Find the derivative of $e^{\sinh^{-1} x}$.

12. Show that $\cosh^2 x+\sinh^2 x=\cosh(2x)$.

13. Find the derivative of $\operatorname{sech}^{-1}x$.

14. Verify Lagrange' Mean Value Theorem for the function $f(x)=x^2$ where $x\in[a,b]$.

15. Solve the differential equation $\frac{d^2y}{dx^2}-6\frac{dy}{dx}+9y=0$

16. Find the n^{th} derivative of $(ax+b)^n$.

17. Find $\frac{dy}{dx}$ when $x^3+y^3=3axy$.

18. Find the highest power of 7 which divides 900!

19. Find the sum of divisors of 4116

ow that, If $a \equiv b \pmod{n}$ and $b \equiv c \pmod{n}$, then $a \equiv c \pmod{n}$.

eparate into real and imaginary parts $\sin(\alpha - i\beta)$.

Find the modulus of $(1-i)^{100}$.

SECTION – III

Answer any **six** questions among the questions **23** to **31**. They carry **4** marks each

23. Find the minimum value of $x + y$ subject to $xy = 16$, $x > 0$ and $y > 0$

24. Find the n the derivative of $x^n e^x$.

25. Show that $\mathcal{L}\{\sin at\} = \dfrac{a}{s^2 + a^2}$

26. Find the inverse Laplace Transform of $\dfrac{3s + 7}{s^2 - 2s - 3}$.

27. If $x^y = e^{x-y}$, prove that $\dfrac{dy}{dx} = \dfrac{\ln x}{(1 + \ln x)^2}$.

28. Find $\dfrac{\partial z}{\partial x}$, if the equation $yz - \ln z = x + y$.

29. Show that $4^{2n+1} + 3^{n+2}$ in a multiple of 13.

30. If a is not a multiple of 7, prove that either $a^3 + 1$ or $a^3 - 1$ is divisible by 7.

31. Show that $\ln(1+i) = \dfrac{1}{2}\ln 2 + i\dfrac{\pi}{4}$.

SECTION – IV

Answer any **two** questions among the questions **32** to **35**. They carry **15** marks each.

32. (a) State and prove Rolle's Theorem.

(b) Find the derivative of

$$y=\sqrt{\sin x+\sqrt{\sin x+\sqrt{\sin x+\sqrt{+\ldots}}}}$$

33. Find the general solution of the partial differental equation $a\left(\frac{\partial z}{\partial x}+\frac{\partial z}{\partial y}\right)=z$.

34. Use the theory of congruences to verify that 89 divides $2^{44}-1$ and 97 divides $2^{48}-1$.

35. (a) Show that e^{z} is analytic and find its derivative

(b) Find $(-27i)^{1/3}$.

(Pages : 3) D – 5190

Reg. No. : ....

Name : ....

First Semester B.Sc. Degree Examination, February 2018
Career Related First Degree Programme under CBCSS
Group 2(b) : COMPLEMENTARY COURSE FOR COMPUTER SCIENCE
MM 1131.10 : MATHEMATICS – I
(2013 Admission Onwards)

Time : 3 Hours Max. Marks : 80

SECTION – I

All the **first ten** questions are **compulsory**. They carry **1** mark **each** :

1. Find the derivative of log(cosh x).
2. Find $\frac{dy}{dx}$ if $3x^2 - 2y^2 = 1$.
3. State Leibnitz's theorem.
4. What is the Laplace transform of $e^{at}\, t^n$?
5. If $f(D) = D^2 - 2$, find $\frac{1}{f(D)} e^{2x}$.
6. Solve $\frac{d^2y}{dx^2} - y = 0$.
7. Show that the congruence $111 \equiv -9 \pmod{40}$ holds.
8. Write the prime factorization of 9555.
9. Evaluate $(\bar{z})^4$ where $z = -1 + \sqrt{3}\, i$.
10. Find the image of the point $z = 2 + 3i$ under the mapping $w = f(z) = z(z - 2i)$.

SECTION – II

Answer **any 8** questions from among the questions **11** to **22**. They carry **2** marks **each**.

11. Derive the derivative of $\sinh^{-1} x$.
12. Verify Rolle's theorem for the function $f(x) = x^2$ in the interval $[-1, 1]$.
13. Find the derivative of $x^{\sin x}$.

P.T.O.

14. Solve $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 9y = 0$.

15. Find the Laplace transform of $e^{-3t}[2\cos 5t - 3\sin 5t]$.

16. Find the partial differential by eliminating the arbitrary function from $z = f(x^2 - y^2)$.

17. If a, b, c and m are integers, with $m > 0$, such that $a \equiv b(\text{mod } m)$, then show that $a + c \equiv b + c(\text{mod } m)$.

18. Find the greatest common divisor (252, 198) using Euclidean algorithm.

19. State the Unique factorization theorem.

20. Find the domain of the complex mapping $f(z) = \frac{1}{z^2 + 1}$.

21. Find all the fifth roots of unity.

22. Separate $\cos(x + iy)$ into real and imaginary parts.

SECTION – III

Answer **any 6** questions from among the questions **23** to **31**. They carry **4** marks **each**.

23. If $\frac{x}{x - y} = \log \frac{a}{x - y}$, prove that $\frac{dy}{dx} = 2 - \frac{x}{y}$.

24. Find $\frac{d^n y}{dx^n}$ if $y = x^n e^x$.

25. Find c for the Mean Value theorem if $f(x) = x(x - 1)(x - 2)$; $x \in \left[0, \frac{1}{2}\right]$.

26. Find the differential equation of all circles of radius r.

27. Find the inverse Laplace transform of $\frac{4s - 3}{s^2 - 4s - 5}$.

28. What is the remainder when 7.8.9.15.16.17.23.24.25.43 is divided by 11 ?

29. Prove that if n is a composite integer, then n has a prime factor not exceeding $\sqrt{n}$.

30. Find the absolute value of $\frac{|i(2 + 3i)(5 - 2i)|}{(-2 - i)}$.

31. Find all the roots of $\left(8 + 8\sqrt{3}i\right)^{\frac{1}{4}}$.

SECTION – IV

Answer **any 2** questions from among the questions **32** to **35**. They carry **15** marks **each**.

32. a) Find the maxima and the minima of the function $f(x) = x^3 - 12x^2 + 45x$ in the interval [0, 7].

    b) State and prove Lagrange's mean value theorem.

33. a) Solve $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = xe^{3x}$.

    b) Use Laplace transform to solve the differential equation $2\frac{d^2y}{dx^2} + 5\frac{dy}{dx} - 3y = 0$ given that $y(0) = 4$ and $y'(0) = 9$.

34. a) State and prove Fermat's theorem.

    b) What is the remainder when 6^{2000} is divided by 11 ?

35. a) Separate $\tan^{-1}(\alpha + i\beta)$ into real and imaginary parts.

    b) Write the complex function $Re(z^3) + Im(z + 1) - 3iz$ in the form $u(x, y) + iv(x, y)$ by separating into real and imaginary parts.

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F – 2061

Reg. No. : 32014893012

Name : Noora N A

First Semester B.Sc. Degree Examination, November 2018

Career Related First Degree Programme under CBCSS

Group 2(b) : COMPLEMENTARY COURSE FOR COMPUTER SCIENCE

MM 1131.10 : Mathematics – I

(2013 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – I

All the **first ten** questions are **compulsory**. They carry **1** mark **each**.

1. Derive the derivative of cosh x from its definition.
2. State the necessary condition for f(c) to be an extreme value of f(x).
3. What is the geometrical interpretation of Lagrange's mean value theorem ?
4. What is the degree of the differential equation $\frac{d^2y}{dx^2} + x\frac{dy}{dx} + x^2y = 0$?
5. What is the Laplace transform of sin at ?
6. Solve $\frac{d^2y}{dx^2} + y = 0$.
7. Find the prime factorization of 9999.
8. State Fermat's theorem.
9. Let $z = x + iy$. Find $\text{Im}\left(\frac{1}{\bar{z}}\right)$.
10. Express $\frac{3i^{20} - i^{19}}{2 - i}$ in modulus-amplitude form.

SECTION – II

Answer **any 8** questions from among the questions **11** to **22**. They carry 2 marks **each** :

11. Find the derivative of $(\cos x)^{\log x}$.
12. Use implicit differentiation to find $\frac{dy}{dx}$ if $5y^2 + \sin y = x^2$.

P.T.O.

13. Find c of Rolle's theorem for the function $f(x) = \sin x$ in $[0, \pi]$.
14. Form the partial differential equation by eliminating the arbitrary constants a and b from $z = (x + a)(y + b)$.
15. Find the inverse Lalace transform of $\frac{5}{s^2 + 2s - 3}$.
16. Solve $(D^2 - 4)y = e^{2x}$.
17. If a, b, c and m are integers, with $m > 0$, such that $a \equiv b \pmod{m}$, then show that $ac \equiv bc \pmod{m}$.
18. State the Unique factorization theorem.
19. What is the remainder when 5^{100} is divided by 7 ?
20. Find all the pre-images of – 1 in the z-plane under the complex mapping $w = f(z) = z(z - 2i)$.
21. Find the fourth roots of unity.
22. Separate $\cos(x - iy)$ into its real and imaginary parts.

SECTION – III

Answer **any 6** questions from among the questions **23** to **31**. They carry 4 marks **each** :

23. If $y\sqrt{1-x^2} + x\sqrt{1-y^2} = 1$, find $\frac{dy}{dx}$.
24. Find the n^{th} derivative of $x^3 \cos x$.
25. Find c of the mean value theorem if $f(x) = x^2 - 3x - 1$ in $\left[\frac{11}{7}, \frac{13}{7}\right]$.
26. Find the differential equation corresponding to the family of curves $y = c\ (x - c)^2$ where c is an arbitrary constant.
27. Find the particular integral of $\frac{d^2y}{dx^2} + \frac{dy}{dx} = x^2 + 2x + 4$.
28. Using Wilson's theorem, find the remainder when 8.9.10.11.12.13 is divided by 7.
29. Prove that there are infinitely many primes.
30. Find the image of the line $y = x + 2$ in the x – y plane under the mapping $w = iz$.
31. Find all the values of $\left(\frac{1}{2} + i\frac{\sqrt{3}}{2}\right)^{\frac{3}{4}}$.

SECTION – IV

Answer **any 2** questions from among the questions **32** to **35**. They carry **15** marks **each** :

32. a) Determine the value of x for which the function given by $12x^5 - 45x^4 + 40x^3 + 6$ attains a maximum value.

    b) State and prove Leibnitz's theorem.

33. a) Solve $(D^2 - 4D + 4)\, y = 8\,(e^{2x} + \sin 2x + x^2)$.

    b) Find the inverse Laplace transform of $\frac{7s+13}{s(s^2+4s+13)}$.

34. a) Prove that the Euclidean algorithm produces the greatest common divisor of two integers.

    b) Use the Eluclidean algorithm to find the greatest common divisor of 51 and 87.

35. a) Express the complex mapping $f(z) = \frac{z-1}{1+2z}$ in the form $u(x, y) + iv(x, y)$ by separating into real and imaginary parts.

    b) Separate $\tan(x + iy)$ into its real and imaginary parts.

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Reg. No. : ....

Name : ....

First Semester B.Sc. Degree Examination, November 2019

Career Related First Degree Programme under CBCSS

Complementary Course I for Computer Science

MM 1131.10: MATHEMATICS I

(2014-2018 Admissions)

Time : 3 Hours

Max. Marks : 80

SECTION – A

All the first ten questions are compulsory. Each question carries ***1*** *marks*

1. Write the derivative of coshx in terms of exponential function
2. State Lagrange's Mean value theorem.
3. State Quotient rule of differentiation.
4. Give an example for a first order linear differential equation.
5. Define Laplace transform of a function F[t].
6. State Fermat's theorem.
7. If 144 $\equiv$ x mod 7 find x.
8. Define Conjugate of a complex number.
9. Find the real part of the complex number $z = (2 + 3i)^2$.
10. Write the polar form of a complex number.

SECTION – B

Answer ***any eight*** *questions from 11 to 22. Each question carries* ***2*** *marks.*

11. Find the logarithmic expression for the inverse hyperbolic function $y = \sinh^{-1} x$

12. Find the slope of the tangent to the parabola $y = x^2$ at the point (2,4).

13. Find $\frac{dy}{dx}$ if $y = x^{\sin(x)}$.

14. Find $L[t]$.

15. Solve $\frac{dy}{dx} = \frac{-y}{x}$

16. Show that y = cosx and y = sin x are solutions of the homogeneous linear differential equation $y'' + y = 0$..

17. Write the prime factorization of 2520.

18. Determine the value of $\varphi(540)$.

19. Let p be a prime number and a, $b \in \mathbb{N}$. If p divides ab, then prove that p divides either a or b.

20. Find the cube roots of unity.

21. Find the real and imaginary pans of the complex number $\frac{i}{3+3i}$.

22. Find the polar form of the complex number $z = -2 + 2i$.

SECTION – C

*Answer **any six** questions from 23 to 31. Each question carries **4** marks.*

23. Show that every differentiable function is continuous.

24. Find the greatest and least values of the function $3x^4 - 2x^3 - 6x^2 + 6x + 1$ in the interval $[0, 2]$.

25. Find $L[\cos at]$.

26. Find $L^{-1}\left[\dfrac{4s - 3\pi}{s^2 + \pi^2}\right]$.

27. Solve the differential equation $y' - y = e^{2x}$.

28. Using Euclidian algorithm find the GCD of 4076 and 1024. Hence express the GCD as a linear combination of 4076 and 1024.

29. Find the remainder when 15! is divided by 19.

30. Check whether the function $f(z) = e^x(\cos y + i \sin y)$ is analytic.

31. State De Moivre' s formula. Hence prove that $\cos 2\theta = \cos^2\theta - \sin^2\theta$ and $\sin 2\theta = 2\cos\theta \sin^2\theta$

SECTION – D

*Answer **any two** questions from 32 to 35. Each question carries **15** marks.*

32. (a) State Rolle's theorem and verify Rolle's theorem for the function $x(x+3)e^{\frac{-x}{2}}$ in $[-3,0]$.

(b) Examine the polynomial $10x^6 - 24x^5 + 15x^4 - 40x^3 + 108$ for maximum and minimum values.

33. (a) Solve the initial Value Problem $y''+y'-2y=0,\ y(0)=4,\ y'(0)=-5$.

(b) Find the inverse Laplace transform of $F(s)=\dfrac{3s-137}{s^2+2s+401}$.

34. (a) Show that $\sqrt{2}$ is irrational.

(b) State and prove Wilson's theorem.

35. (a) Find the real and imaginary part of the function $f(z)=2iz+6\bar{z}$. Also find the value of f at $z=\dfrac{1}{2}+4i$.

(b) Show that $\cos z=\cos x\cosh y-i\sin x\sinh y$.

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Reg. No. : ....

Name : ....

First Semester B.Sc. Degree Examination, December 2016
Career Related First Degree Programme under CBCSS
Group 2(b) : Complementary Course for Computer Science
MM 1131.10 : MATHEMATICS – I
(2013 Admission Onwards)

Time : 3 Hours Max. Marks : 80

SECTION – I

All the **first ten** questions are **compulsory**. They carry **1** mark **each**.

1. Find the derivative of log (tanh x).

2. State Rolle's theorem.

3. Write down the n^{th} derivative of the function sin (ax + b).

4. Show that $y = c_1e^x + c_2e^{-x}$ is a solution of the differential equation $y'' - y = 0$.

5. Find the first order partial derivatives of the function :
   $f(x, y) = 8x^3y + 4xy^2 - 12x + 8y - 10$ at the point (2, 0).

6. Find the general solution of the differential equation $y' + 2xy = 0$.

7. If $\mathcal{L}$ denotes the Laplace transform operator, then what is $\mathcal{L}(\cosh at)$.

8. Prove that $3n^2 - 1$ is never a perfect square.

9. Determine the principal value of the argument $1 - i$.

10. Define Euler phi-function.

P.T.O.

SECTION – II

Answer **any 8** questions from among the questions **11** to **22**. These questions carry 2 marks **each**.

11. Prove that $\tanh 2x = \dfrac{2\tanh x}{1+\tanh^2 x}$.

12. Verify Langrange's mean value theorem for the function $f(x) = x + \dfrac{1}{x}$, $x \in \left[\dfrac{1}{2}, 2\right]$.

13. Find the n^{th} differential coefficient of $y = x^2 e^{2x}$.

14. Solve the differential equation $y'' + 6y' + 9y = 0$.

15. Find the equation of the curve which passes through the origin and has the slope $x + 3y - 1$.

16. Evaluate $\mathcal{L}(e^t \cos^2 t)$.

17. Use the convolution theorem to evaluate $\mathcal{L}^{-1}\left(\dfrac{1}{(s+2)(s-1)}\right)$.

18. Using Euclidean Algorithm, find gcd (12378, 3054).

19. Compute $\phi(1575)$ where ϕ is the Euler's function.

20. Show that 41 divides $2^{20} - 1$.

21. Find $\tanh x$, if $5 \sinh x - \cosh x = 5$.

22. Find the polar form of the complex number $-1 - i\sqrt{3}$.

SECTION – III

Answer **any 6** questions from among the questions **23** to **31**. These questions carry **4** marks **each**.

23. Find the derivative of $y = (\log x)^{\tan x}$.

24. A rectangular field is to be bounded by a fence on three sides by a straight stream on the fourth side. Find the dimensions of the field with maximum area that can be enclosed with 1000 feet of fence.

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25. Solve the differential equation $(x^2 - y^2)\,dx - xydy = 0$.

26. Solve the initial value problem $y'' - y' - 2y = 0$, $y(0) = -4$, $y'(0) = -17$.

27. Find the general solution of the partial differential equation $x^2u_{xy} - 3y^2u = 0$.

28. Find the inverse Laplace transform of $\frac{3s+1}{(s-1)(s^2+1)}$.

29. Find the remainder obtained upon dividing the sum $1! + 2! + 3! + \ldots 100!$ by 12.

30. Prove that if $a = bq + r$, then $\gcd(a, b) = \gcd(b, r)$.

31. Find all the different values of $(-i)^{1/5}$.

SECTION – IV

Answer **any 2** questions from among the questions **32** to **35**. These questions carry **15** marks **each**.

32. a) Given $\tanh x = -\frac{7}{25}$, find the other five hyperbolic functions.

    b) If $y = \sin(m \sin^{-1} x)$, prove that $(1 - x^2)\, y_{n+2} - (2n + 1)\, xy_{n+1} + (m^2 - n^2)y_n = 0$.

33. Solve the non homogeneous equation $y'' - 2y' = e^x \sin x$.

34. a) Using Laplace transform, solve the integral equation.

    $$y(t) = t^3 + \int_0^t \sin(t-u)\, y(u)\, du.$$

    b) Using Laplace transform solve the initial value problem $y'' + y = 3\cos 2t$, $y(0) = 0$, $y'(0) = 0$.

35. a) State and prove Lagrange's mean value theorem.

    b) If $\gcd(a, b) = 1$, show that $\phi(ab) = \phi(a)\,\phi(b)$.

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(Pages : 3)

Reg. No. : 320.138.930.10........

Name : ....Sufiyan S....................

First Semester B.Sc. Degree Examination, January 2016
(Career Related First Degree Programme under CBCSS)
Group – 2 (b) : Complementary Course for Computer Science
MM 1131.10 : MATHEMATICS – I
(2013 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

All the **first 10** questions are **compulsory**. These questions carry **1** mark **each** : (10×1=10 Marks)

1. Find $\frac{d}{dx}(\cos(4x-3))$.

2. Find $\frac{d}{dx}x^2e^{8x}$.

3. State Rolle's theorem.

4. Find the order and degree of the differential equation $\left(\frac{d^3y}{dx^3}\right)^3+\left(\frac{d^2y}{dx^2}\right)^4+y=0$.

5. Solve the equation $(D^2-4D+4)\,y=0$.

6. Fill in the blank : $L^{-1}\left(\frac{a}{s^2+a^2}\right)=$ ________

7. Write down the statement of Fermat's theorem.

8. If $a\equiv b\ (\text{mod}\ n)$ and $a'\equiv b'(\text{mod}\ n)$ prove that $a+a'\equiv b+b'(\text{mod}\ n)$.

9. Evaluate $\frac{(1+i)(7+i)}{(4-3i)}$.

10. If $x=\cos\theta+i\sin\theta$, find $x^3+\frac{1}{x^3}$.

P.T.O.

Answer **any 8** questions from among the questions **11** to **22**. These questions carry **2** marks **each**. **(8×2=16 Marks)**

11. Using logarithmic differentiation, find $\frac{dy}{dx}$ where $y = x^x$.

12. Find $\frac{dy}{dx}$, if $x^3 + y^3 = 3axy$.

13. Find $\frac{dy}{dx}$, if $y = \frac{\sin x}{1+\tan x}$.

14. Solve the equation $\frac{dy}{dx} - y \cot x = 2x \sin x$.

15. Find $L\,(x^2 \cosh ax)$.

16. Find $L^{-1}\left(\frac{s+1}{s^2+2s+2}\right)$.

17. Find the Laplace transform of $f(t) = \begin{cases} e^{-t} & \text{if } 0 < t < 4 \\ 0 & \text{if } t \geq 4 \end{cases}$.

18. Using Euclidean algorithm find the g.c.d. of 4824 and 2072.

19. If p is prime and p divide ab (where a and b are integers), prove that either p divides a or p divides b.

20. Prove that square of any integer is either 3k or 3k + 1.

21. Prove that $\sin h^{-1} x = \log_e\left(x + \sqrt{x^2+1}\right)$.

22. Find Log (1 + i).

Answer **any 6** questions from the questions **23** to **31**. These questions carry **4** marks **each**. **(6×4=24 Marks**

23. Determine the maxima and minima of $x^3 - 18x^2 + 96x + 4$.

24. State and prove the mean value theorem.

25. Solve $(D^2 + 9)y = \cos 3x$.

26. Find $L^{-1}\left(\frac{5s+4}{(2s+3)(s-2)}\right)$.

27. Find the Laplace transformation of $\frac{e^{-at}-1}{t}$.

28. Separate into real and imaginary ports of $\tan^{-1}(x+iy)$.

29. Find all the values of $(1+i)^{1/3}$.

30. Prove that for any integer n, $n^5 - n$ is divisible by 30.

31. Find $\phi(437)$ and show that $16^{99} \equiv 1 \pmod{437}$.

Answer **any 2** questions from among the questions **32** to **35**. These questions carry **15** marks **each** : **(2×15=30 Marks)**

32. a) Find the n^{th} derivative of x^2e^{5x}.

    b) If $y = e^{\tan^{-1}x}$, prove that

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

33. a) Solve $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = x^2$.

    b) Using Laplace transformations, solve $\frac{d^2y}{dx^2} + 4y = 13e^{3t}$ given that $y(0) = 0$ and $y'(0) = 5$.

34. a) State and prove Wilson's theorem.

    b) Find the remainder when 2^{1000} is divisible by 13.

35. a) Prove that $i^i = e^{\frac{-(4n+1)\pi}{2}}$.

    b) If $\cos(x+iy) = \cos\theta + i\sin\theta$, prove that $\cos 2x + \cosh 2y = 2$.

(Pages : 4)

L – 3934

Reg. No. : ....

Name : ....

First Semester B.Sc. Degree Examination, August 2021

Career Related First Degree Programme under CBCSS

Mathematics

Complementary Course I for Computer Science

Mathematics I

MM 1131.10 : CALCULUS AND NUMBER THEORY

(2019 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – I

All the **ten** questions are compulsory.

1. Write the mathematical equation of the hanging cable.

2. Draw the graph of $y = \tanh^{-1}(x)$.

3. What is $\frac{d}{dx}\left(\sinh^{-1} x\right)$.

4. Evaluate $\int \frac{1}{x^5}\, dx$.

5. Find the area under the graph of $y = \sin x$ over the interval $[0, \pi]$.

P.T.O.

6. Evaluate $\int \frac{\cos x}{\sin^2 x}\, dx$.

7. If $y = f(x)$ is a smooth curve on the interval $[a, b]$, then find the arc length of this curve over $[a, b]$.

8. Solve $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 5y = 0$.

9. Find $\phi(19)$.

10. State Fermat's theorem.

($10 \times 1 = 10$ Marks)

SECTION – II

Answer any **eight** questions.

11. Show that $\frac{d(\sinh x)}{dx} = \cosh x$.

12. Find $\frac{d}{dx}\left(\frac{x}{x+1}\right)$.

13. Find the parametric representation of the curve $x^2 - y^2 = 1$.

14. Evaluate $\int \sin^2 x \cos x\, dx$ by substitution method.

15. Find the area of the region bounded above by $y = x + 6$, bounded below by $y = x^2$, and bounded on the sides by the liens $x = 0$ and $x = 2$.

16. Write the general form of a Cauchy-Euler differential equation of order 3.

17. Find the complimentary function associated with $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} - 10y = e^{2x}$.

18. Solve $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} = 4y + x^2$.

19. Solve $\frac{d^2y}{dx^2} = xe^x$.

20. Find GCD(40, 148)

21. State Wilson's theorem.

22. Solve $2x - 4 \equiv 0 \bmod 6$.

(8 × 2 = 16 Marks)

SECTION – III

Answer any **six** questions.

23. Prove that $\tanh^{-1}(x) = \frac{1}{2}\ln\left(\frac{1+x}{1-x}\right)$.

24. Write the domain and range of $\sinh^{-1}(x)$ and $\cosh^{-1}(x)$.

25. Find the area under the graph of $y = x^2$ over the interval $[0, 1]$.

26. Evaluate the integral $\int (2+y^2)^2 dx$ and verify the answer by using differentiation.

27. By substitution method, evaluate $\int x^2\sqrt{x-1}\,dx$.

28. Using Partial fractions, evaluate $\int \frac{2x+4}{x^3 - 2x^2} dx$.

29. Explain the method of solving Legendre's differential equations.

30. Compute $\phi(2^3 3^4 7^2)$ and state the property of Euler's function used for computation.

31. If n is a prime number greater than 7, then is $n^6 - 1$ is divisible by 504?

(6 × 4 = 24 Marks)

SECTION – IV

Answer any **two** questions.

32. (a) If $y = e^{ax}\sin bx$ show that $y_2 - 2ay_1 + (a^2+b^2)y = 0$.

(b) If $y = \sin(m\sin^{-1}x)$, prove that $(1-x^2)y_2 - xy_1 + m^2y = 0$ and deduce that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2-m^2)y_n = 0$.

33. (a) Find the area of the region enclosed by $x = y^2$ and $y = x - 2$.

(b) Find the area of the surface that is generated by revolving the portion of the curve $y = x^2$ between $x = 1$ and $x = 2$ about the y–axis.

(c) Write the formula for the volume V of the solid of revolution S that is generated by revolving the region R about the y–axis.

34. (a) Solve $x^2\dfrac{d^2y}{dx^2} + 2x\dfrac{dy}{dx} - 20y = x^4$.

(b) Solve $x^2\dfrac{d^2y}{dx^2} + x\dfrac{dy}{dx} + y = x + \log x$.

35. (a) Show that 437 divides 18! + 1.

(b) Explain steps in Euclid's algorithm. Give an example.

(2 × 15 = 30 Marks)

SK

KTCT COLLEGE OF ARTS & SCIENCE, KALLAMBALAM

BSC

First Semester ~~B.B.A~~ Degree Examination (Model Question)

BSC

First Degree programme under CBCSS

MM1141 – Methods of

Time 3 Hr **Core Course: ~~AA 0000~~ MATHEMATICS** Max Marks: 80

(2014 Admissions)

Section-A **[Very Short Answer]**

I. **Answer all questions, Each question carries 1 mark.**

1. Define Congruence
2. State well-ordering principle
3. State Euclid's theorem
4. State Division theorem
5. Define the Least Common Multiple
6. Find the GCD of 42 & 72
7. What is Fermatt numbers
8. Define Bezouts's Identity
9. Define Greatest Common Devisor
10. Define Fundamental Theorem of Arithmetic

(10 x 1 = 10)

Section-B

II. **Answer any 8 questions, Each question carries 2 marks.**

11. Find the GCD of 21063 & 43137 using Euclid's algorithm with division.
12. Convert 1976 into base 2.
13. P.T $\sqrt{2}$ is an irrational number
14. If d=(a,b) and ar+bs=d, then (r,s)=1
15. Find the smallest k>0 such that 12/qk
16. Show that m=[a,m] iff a/m
17. If 182 is congruent to 119 (mod 9)
18. Write 975 in exponential notation
19. If 'a' divides 'bc' and (a,b=1) then , PT 'a' divides 'c'.
20. If 'e' divides 'a' and 'e' divides 'b' then 'e' divides (a,b)
21. Define two forms of Induction

22. 7.

(8 x 2 = 16)

Section-C

III. **Answer any 6 questions, Each question carries 4 marks.**

23
22. Find the solution of $203x+119y = 49$ for the smallest possible $x \geq 0$
24 23. *Any natural number greater than one factors into a product of primes.*
25 24. State and prove Euclid's theorem.
26 25. If $m \neq n$, then $F(m)$ and $F(n)$ are relatively prime
26. PT $m[a,b] = [ma,mb]$.
27 27. State and prove Division theorem
28 28. For $n \geq 1$, 16^n-16 is divisible by 24.
29 29. PT $n! \geq 2^n$ for $n \geq 4$
30
31 - 2

(6 x 4 = 24)

Section-D

IV. **Answer any 2 questions, not to exceed four pages. Each question carries 15 marks.**

32 30. Find the GCD of 365, 1876 and represent the GCD $d = r.365 + s.1876$.

33 31. a. Prove if $x \equiv y \pmod m$, then $(x,m) = (y,m)$.
b. Decide whether the equation $36x + 45y = 80$ has a solution or not

34 32. Find the solution with smallest $x > 0$

a. $36x + 45y = 0$
b. $267x + 112y = 3$

35 33. Let $a = P_1^{e1} P_2^{e2} \ldots\ldots P_r^{er}$ and $b = P_1^{f1} P_2^{f2} \ldots\ldots P_r^{fr}$

a. a/b iff $ei \leq fi$
b. Let a and b be natural numbers, suppose $b = aq + r$, for some $q \geq 0$ and $0 \leq r < a$, then q and are unique

(2 x 15 = 30)