Reg. No. | | | | | | | | | | | |

BSCMTEN 303

IV Semester Open Elective (NEP-2020) Examination, July/August 2023
(2022-23 Batch Onwards)
MATHEMATICS
Vedic Mathematics

Time : 2 Hours | Max. Marks : 60

Instructions : *1) Answer **any eight** questions from Part – **A**. **Each** question carries **3** marks.*

*2) Answers to Part – **A** should be written in the **first** few pages of the **main** answer book, before Part – **B**.*

*3) Answer **any six** questions from Part – **B** choosing **two** questions from **each** Unit. **Each** question carries **6** marks.*

*4) Calculators are **not** allowed.*

PART – A

Answer **any eight** questions. **(8×3=24)**

1. Find 85^2, using Ekadhikena Poorvena method.
2. Using Ekanunena Poorvena method, find 624×999.
3. Find 94×92, using Nikhilam Navatashcaramam Dashatah Sutra.
4. Using Nikhilam method, find 128×672.
5. Find quotient and remaider when 60 is divided by 9 using Nikhilam Sutra.
6. Using Nikhilam Sutra, find quotient and remainder when 1225 is divided by 12.
7. Show that 42 is divisible by 7, using osculation process.
8. Find the Osculators for 7, 13 and 17.
9. Using Yavadunam Sutra, find 19^2.

P.T.O.

10. Find $\sqrt{1521}$ using Yavadunam Sutra.

11. Using Yavadunam Sutra, find 92^3.

12. Find cube root of 39304 using Yavadunam Sutra.

PART – B

Answer **any six** questions, choosing **two** questions from **each** Unit : **(6×6=36)**

Unit – I

13. Find using Urdhva Tiryagbhyam method : (a) 21 × 23, (b) 108 × 108.

14. Using Nikhilam Navatashcaramam Dashatah method, find (a) 356 × 999 (b) 888 × 998.

15. Using Nikhilam method, find (a) 532 × 528, (b) 235 × 247.

16. Using both Urdhva Tiryagbhyam and Nikhilam Navatashcaramam Dashatah methods, find 576 × 328.

Unit – II

17. Find quotient and remainder for 43999/828 by Paravartya Yogayat method.

18. Using Dhwajank method, find quotient and remainder when 37941 is divided by 47.

19. Using Ekadhikena Purvena method, find $\frac{1}{29}$.

20. Using osculation method, find whether 21953 is divisible by 53.

Unit – III

21. Find 88^2 and 96^2, using Yavadunam Sutra.

22. Find $\sqrt{4096}$ and $\sqrt{9604}$.

23. Find $\sqrt[3]{328509}$ and $\sqrt[3]{531441}$.

24. Solve : $2x + 3y = 8$ and $4x + 5y = 14$ by using Paravartya rule.

Reg. No. | | | | | | | | | | | |

BSCPHCN 401

Fourth Semester B.Sc. Examination, July/August 2023
(NEP-2020) (2022 – 23 Batch Onwards)
PHYSICS (DSCC)
Thermal Physics and Electronics

Time : 2 Hours Max. Marks : 60

Instructions : *1) Answer questions from **all** Parts.*
*2) Scientific calculators are **allowed.***

PART – A

I. Answer **any four** of the following. **(4×2=8)**

1) How does available energy in a system vary with entropy ? Explain.
2) Give any two differences between isothermal and adiabatic process.
3) Explain Maxwell's third relation (Relation between T and V) in Thermodynamics.
4) Obtain the relation between α and β in a transistor.
5) What do you mean by forward bias of a p-n diode ?
6) Write the truth table of EXOR gate.

PART – B

II. **Note** : Answer **one full** question from **each** Unit by availing the internal choice. **(10×4=40)**

Unit – I

7) a) Derive the expression for the work done in an adiabatic process. **4**

b) Define the term Entropy. Explain entropy change in isothermal, adiabatic, reversible and irreversible process. **6**

OR

8) a) Explain the parts of ideal heat engine. **4**

b) Derive the relation PV^{γ} = a constant for an ideal gas undergoing adiabatic change. **6**

P.T.O.

Unit – II

9) a) What is Joule-Thomson effect ? Explain the principle of porous plug experiment and give the expression for Joule-Thomson coefficient. 4

b) State Wien's displacement law. Hence explain Wien's law of energy distribution. What is its limitation ? 6

OR

10) a) State and explain Maxwell-Boltzmann distribution law of velocities along with relevant graph. 4

b) Derive Planck's law of black body radiation. 6

Unit – III

11) a) Explain the formation of unbiased p-n junction. 4

b) What is a rectifier ? Explain the working of full wave bridge rectifier with circuit diagram and input-output waveforms. Mention the expression for its efficiency and ripple factor. 6

OR

12) a) Draw the voltage divider bias circuit. Write expressions for the operating points I_{CQ} and V_{CEQ}. 4

b) With neat circuit diagram, explain how line regulation and load regulation achieved in Zener voltage regulator. 6

Unit – IV

13) a) Explain input offset voltage, input resistance, slew rate and differential voltage gain. 4

b) State and explain de Morgan's theorems. Give their circuit equivalent. 6

OR

14) a) Convert $(468.48)_{10}$ into its hexadecimal equivalent. 4

b) Derive an expression for the voltage gain of non-inverting amplifier using OPAMP. Explain how is it converted into voltage follower. 6

PART – C

III. Answer **any three** questions. **(3×4=12)**

15) a) A Carnot engine working between two temperatures has an efficiency of 40%. When the temperature of source alone is increased by 80°C the efficiency is increased to 50%. Find the temperature of the sink and source in both cases.

b) Calculate the depression in freezing point of ice for an increase in pressure of 1 atm. Volume occupied by 1 kg of ice = $1.091 \times 10^{-3} m^3$.

c) For a transistor with voltage divider bias in CE mode obtain the operating point using the following data. $R_1 = 40\ k\Omega$, $R_2 = 4\ k\Omega$, $R_C = 10\ k\Omega$, $R_E = 2\ k\Omega$, $V_{CC} = 22\ V$, $V_{BE} = 0.7V$.

d) The differential gain of an OPAMP is 10^5. When a common mode input voltage of 1 mV is applied, the output voltage becomes 12 mV. Calculate CMRR and express it in dB.

Reg. No. | | | | | | | | | | | |

BSCMTCN 401

Fourth Semester B.Sc. Degree Examination, July/August 2023
(NEP 2020) (2022 – 23 Batch Onwards)
MATHEMATICS
Partial Differential Equations and Integral Transforms (DSCC)

Time : 2 Hours Max. Marks : 60

Instructions : *1) Answer **any ten** questions from Part – **A**. **Each** question carries **2** marks.*
*2) Answers to Part – **A** should be written in the **first** few pages of the answer book before answers to Part – **B**.*
*3) Answer **any eight** questions from Part – **B** choosing **two** questions from **each** Unit. **Each** question carries **5** marks.*
*4) **Use** of Scientific calculator is **permitted**.*

PART – A

Answer **any ten** questions. **(10×2=20)**

1. Find a partial differential equation by eliminating a and b from $z = ax + by + a^2 + b^2$.
2. Form a partial differential equation by eliminating arbitrary function ϕ from $z = e^{mx}\,\phi(x + y)$.
3. Find a complete integral of $pq = k$, where k is a constant.
4. Find a complete integral of $p - 3x^2 = q^2 - y$.
5. Solve $(D^3 - 3D^2D' + 2DD'^2)z = 0$.
6. Find the particular integral of $(D^2 + 3DD' + 2D'^2)z = x + y$.
7. Check whether the partial differential equation $\frac{\partial^2 z}{\partial x^2} + 2\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = 0$ is hyperbolic, parabolic or elliptic.
8. Evaluate $L\{e^{at}\}$.

P.T.O.

9. Find L{$\sin^2 at$}.

10. Find $L^{-1}\left\{\frac{1}{s^2+6s+13}\right\}$.

11. Write the formula for L{f'(t)}.

12. Prove that $\int_{-l}^{l} \sin\frac{k\pi x}{l}dx = 0$.

13. If the series $A+\sum_{n=1}^{\infty}\left(a_n \cos\frac{n\pi x}{l}+b_n \sin\frac{n\pi x}{l}\right)$ converges uniformly to F(x) in (–l, l), then find a_0.

14. Find whether the function $f(x) = x^3 + 3x$ is even or odd.

PART – B

Answer **any eight** questions by choosing two questions from **each** Unit. **(8×5=40)**

Unit – I

15. Solve $\left(\frac{y^2z}{x}\right)p + xzq = y^2$.

16. Find a complete integral of px + qy = pq by Charpit's method.

17. Solve the Clairaut equation z = px + qy + pq.

18. Find a complete integral of $9(p^2z + q^2) = 4$.

Unit – II

19. Solve $\frac{\partial^2 z}{\partial x^2}+2\frac{\partial^2 z}{\partial x\partial y}+\frac{\partial^2 z}{\partial y^2}=2x+3y$.

20. Solve $(D^2 - a^2D'^2)z = x$.

21. Solve the partial differential equation $(D^2 - 2DD' + D'^2)z = \tan(y + x)$.

22. Reduce the equation $\frac{\partial^2 z}{\partial x^2}-\frac{\partial^2 z}{\partial y^2}=0$ to canonical form.

Unit – III

23. If f(t) has a Laplace transform and if f(t + p) = f(t), then prove that

$$L\{f(t)\} = \frac{1}{1-e^{-Ps}}\int_0^P e^{-st}f(t)dt$$

24. Find $L^{-1}\left\{\frac{1}{s(s^2+1)}\right\}$ using convolution theorem.

25. If $f(t) = \begin{cases} 0, & 0 < t < 2, \\ 3, & 2 < t < 5, \\ 0, & t > 5 \end{cases}$ find L{f(t)} using unit step function.

26. Solve the initial value problem $\frac{dy}{dt} - 2y = e^{5t}$, $y(0) = 3$.

Unit – IV

27. Expand F(x) = x, 0 < x < 2, in a half range sine series.

28. Find the Fourier coefficients a_0, a_n and b_n corresponding to the function

$$F(x) = \begin{cases} 0, & -5 < x < 0 \\ 3, & 0 < x < 5 \end{cases}, \text{Period} = 10$$

29. Find the (a) finite Fourier sine transform and (b) finite Fourier cosine transform of the function F(x) = 2x, 0 < x < 4.

30. Expand $f(x) = x^2$, $0 < x < 2\pi$ in a Fourier series if the period is 2π.