पूर्वोत्तर पर्वतीय विश्वविद्यालय
जिलाः पूर्वी खासी हिल्स, शिलांग - 793022
मेघालय, भारत

North-Eastern Hill University
District: East Khasi Hills, Shillong - 793022
Meghalaya, India

No. Acad/11/2569

Date: 4th November 2026

NOTICE

There will be an entrance test for admission into the Ph.D. programme in Mathematics on the 25th November, 2026 from 10:00 a.m. to 1:00 p.m., followed by an interview (details of the interview time will be informed after the exam) in the Department of Mathematics, NEHU Shillong, Meghalaya.

Venue for written test: Science Cluster Classrooms (Room No. 20), 3rd Floor, NEHU, Shillong.

Venue for interview: Conference Room of the Mathematics Department.

Note: Only those who score minimum 50% marks in the written test (5% concession for SC/ST/OBC (Non-creamy layer)/EWS/differently abled) will be called for the interview.

Kumar 04.11.2026

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LIST OF ELIGIBLE CANDIDATES FOR THE ENTRANCE TEST TO PHD PROGRAM IN MATHEMATICS AT NORTH-EASTERN HILL UNIVERSITY, SHILLONG ON 25.11.2016

S. No.	FORM NUMBER	NAME OF THE APPLICANT	GENDER	CATEGORY
1	NEHU260003131	NAPHIBAIAR NONGREM	FEMALE	ST
2	NEHU260002745	BADARIAKOR LANGSTIEH	FEMALE	ST
3	NEHU260002915	BAJANAI KONJIR	FEMALE	ST
4	NEHU260002999	KYRPANG DKHAR	MALE	ST
5	NEHU260003121	YOOWANKA SUTING	FEMALE	ST
6	NEHU260003468	DAMEWANPYNBHA PALE	MALE	ST
7	NEHU260003735	BHITALI BARMAN	FEMALE	EWS
8	NEHU260003800	DION TREVOR MARWEIN	MALE	ST
9	NEHU260002819	MAPHIBANRI NONGKHAR	FEMALE	ST
10	NEHU260002951	ILAPYNJANAI WARJRI	FEMALE	ST
11	NEHU260003020	SHARITI LYNGDOH MAIRANG	FEMALE	ST
12	NEHU260003093	SANGEETA SAIKIA	FEMALE	GENERAL
13	NEHU260003120	NAZIMA NASRIN	FEMALE	EWS
14	NEHU260003170	ANUSHREE SAHA	FEMALE	SC
15	NEHU260003190	CHIRANJEEB SARMA	MALE	GENERAL
16	NEHU260003218	RAPBOKLANG KHARBUDON	MALE	ST
17	NEHU260003233	BAIAMONLANG MARBANIANG	FEMALE	ST
18	NEHU260003302	SHAT NARAYAN KUMAR UZIR	MALE	EWS
19	NEHU260003306	FAIRMEWELL SUNGOH	MALE	ST
20	NEHU260003363	BANSIEWDORSHISHA LYNGKHOI	FEMALE	ST
21	NEHU260003371	PYNHUNLANG LYNSER	FEMALE	ST
22	NEHU260003391	ATIKUR RAHMAN	MALE	GENERAL
23	NEHU260003444	LAKHYAJIT SONOWAL	MALE	ST
24	NEHU260003459	CHANCHALA	FEMALE	SC
25	NEHU260003472	DERRICKSON YMBON	MALE	ST
26	NEHU260003522	MAYANA MAYJATCHI R SANGMA	FEMALE	ST
27	NEHU260003546	ECHWAMIDAKA KHAPIAH	FEMALE	ST
28	NEHU260003569	KITDORSINGH IAWREN	MALE	ST
29	NEHU260004446	KALJIMI LAMIN	MALE	ST
30	NEHU260004497	DAMEBANROI BASAIAWMOIT	MALE	ST
31	NEHU260003624	REBECCA LAMARE	FEMALE	ST
32	NEHU260003989	SAJIRUL ISLAM	MALE	GENERAL
33	NEHU260003993	DHANANJAY KUMAR JHA	MALE	EWS
34	NEHU260004117	RIDA BAREH	FEMALE	ST
35	NEHU260004197	KAMNIPAIA PHALANGKI	MALE	ST
36	NEHU260004214	FLORINA GAYARY	FEMALE	ST
37	NEHU260004228	ERICKSON SYIEMLIEH	MALE	ST
38	NEHU260004248	DAMANLANGKI PALE	MALE	ST
39	NEHU260004273	DERICK L NONGBET	MALE	ST
40	NEHU260004434	JADURA TANGBA CH MARAK	MALE	ST
41	NEHU260004471	LARISA NONGRUM	FEMALE	ST
42	NEHU260004523	SWEETY W POHLONG	FEMALE	ST
43	NEHU260004599	JERRY BANTEILANG NONGSPUNG	MALE	ST
44	NEHU260004585	ROSHAN SINGHA	MALE	OBC

DEPARTMENT OF MATHEMATICS
NEHU, SHILLONG

Model Question Paper for Ph.D. Program 2026

Full Marks : 100

Time : 3 hours

Answer all **25** questions from **Group A** and choose any **05** from **Group B**. All the symbols have their usual meaning unless otherwise specified.

Group A

1. Research methodology
   (a) is a way to systematically state a research problem.
   (b) is just a body of research methods.
   (c) refers not only to the research methods but also the logic behind them.
   (d) confines only to the methods of research.

2. Which of the following does constitute criteria for good research?
   (a) The purpose of the research should not be clearly defined using common concepts.
   (b) The procedural design/process should be carefully planned to yield results that are as objective as possible.
   (c) The researcher should omit flaws in the procedural design/process.
   (d) The researcher should omit acknowledgement of fundings, if any.

3. Which of the following constitute one of the problems faced by researchers?
   (a) Timely availability of published data/articles.
   (b) Adequate fundings for projects.
   (c) Adequate secretarial assistance.
   (d) Lack of scientific trainings in the methodology of research.

4. Which of the following constitute one of the points to consider while selecting a research problem?
   (a) Narrow or vaque problems should be encouraged.
   (b) Cost and time factors should be considered.
   (c) Collaborative opportunities should be discouraged.
   (d) The importance of the problem and the qualifications/trainings of a researcher are irrelevant.

5. Which of the following is not a part of the points while defining a research problem?
   (a) Stating the problem in a general way.
   (b) Surveying the available literature.
   (c) Rephrasing the problem into a working proposition.
   (d) Rephrasing someone's work without acknowledging it.

6. Which of the following does not constitute literature survey?
   (a) Personal opinions.
   (b) Abstracting and indexing journals.
   (c) Published or unpublished bibliographies.
   (d) Online search engine like Google scholars.

7. Which of the following does not constitute one of the main basic postulates of scientific methods?
   (a) It relies on unpublished works.
   (b) It uses relevant concepts.
   (c) It aims at formulating most general axioms.
   (d) Its methodology is open to critical scrutiny.

8. In research design, experiments can be of the following two types.
   (a) absolute experiment and comparative experiment.
   (b) theoretical and practical experiment.
   (c) absolute experiment and non-comparative experiment.
   (d) non-absolute experiment and comparative experiment.

9. The overall research design may be split up into _____ parts.
   (a) two
   (b) three
   (c) four
   (d) it is not possible to divide

10. In research design, the variable which is antecedent to the dependent variable is called as _____.
   (a) continuous variable.
   (b) bound variable.

(c) discrete (non-continuous) variable.

(d) free variable.

11. The technical term(s) _____ is(are) used when we design the research study, minimizes the extraneous independent variable(s).

    (a) treatment(s)

    (b) confound(s)

    (c) experimental unit(s)

    (d) control(s)

12. In research design, the effect noticed on the dependent variable as a result of extraneous variable(s) technically described as _____.

    (a) control group(s)

    (b) experimental error(s)

    (c) experimental unit(s)

    (d) pre-determined plot(s) or block(s)

13. In one of the research design namely experimental design Professor Fisher stated _____ principles.

    (a) two

    (b) four

    (c) five

    (d) three

14. Suppose a researcher randomly selects 36 students from a group of students who are to take a course in Mathematics and then divides them into two groups by randomly assigning 18 to team-A, the normal studies programme, and 18 to team-B, the special studies programme. At the end of the course, he/she administers a test to each team in order to judge the effectiveness of the training programme on the students performance level. In this context, which of the following is correct.

    (a) team-A is experimental group and team-B is control group

    (b) team-B is experimental group and team-A is control group

    (c) both team-A and team-B are control groups

    (d) cannot say any thing about team-A and team-B.

15. Let $A = \{(x, y) \in \mathbb{R}^2 | xy > 1\}$ and $B = \{(x, y) \in \mathbb{R}^2 | -2 < y - x < 2\}$ be the subsets of $\mathbb{R}^2$ with subspace topology from $\mathbb{R}^2$. Then $C = A \cap B$ is ____

    (a) connected but not compact.

    (b) compact but not connected.

    (c) connected and compact.

    (d) neither connected nor compact.

16. Consider the set $\mathbb{R}$ of all real numbers with usual metric $d(x, y) =\mid x - y \mid$. Find which one of the following is an open set

    (a) $A =]0, 1] \bigcap [1, 2[$.

    (b) $B = \{1, 2, 3\}$.

    (c) $C =]0, 1[\bigcup]2, 3[$.

    (d) $D = [1, 2[\bigcup]2, 3]$.

17. The number of significant digits in the sum of 0.123×10^3 and 0.456×10^2 are ____

    (a) 3

    (b) 4

    (c) 5

    (d) 6.

18. How many integers from 1 to 200 are divisible by 4 or 6 but not by 12?

    (a) 100

    (b) 51

    (c) 75

    (d) 92.

19. If $f(x, y) = 4x^2 + y^2$ on $S : |x| \leq 1, |y| \leq 1$ satisfies the Lipschitz conditions then the lipschitz constant of this function is

    (a) -1

    (b) 1

    (c) -2

    (d) 2

20. Suppose a dynamical system is described by the Lagrangian

$$L = \dot{q}_1^2 + \dot{q}_2^2 + q_1^2 + \dot{q}_1\dot{q}_2.$$

If p_1 and p_2 denote the conjugate momenta corresponding to the generalized coordinates q_1 and q_2 respectively, then which of the following statements is correct?

(a) $\dot{p}_1 = 2q_1 \;\; \dot{p}_2 = 0.$

(b) $\dot{p}_1 = -2q_1 \;\; \dot{p}_2 = 0.$

(c) $\dot{p}_1 = -\frac{q_1}{2} \;\; \dot{p}_2 = q_2.$

(d) $\dot{p}_1 = q_1 \;\; \dot{p}_2 = -q_2.$

21. Suppose a second-order PDE is hyperbolic in a domain D. Which of the following statements is true?

(a) It must be hyperbolic in every domain $D_1 \subset \mathbb{R}^2$.

(b) It will be hyperbolic in any subdomain $D_1 \subseteq D$.

(c) It will remain hyperbolic everywhere in the plane.

(d) None of the above.

22. Suppose A is a 2×1 matrix that B is a 1×2 matrix. Then $C = AB$ is

(a) invertible.

(b) not invertible.

(c) a 1×1 matrix.

(d) None of the above.

23. The complex line integral $\displaystyle\int_{(0,0)}^{(1,1)} (3x^2 + 4xy + ix^2)dz$ along $y = x^2$ is ____

(a) $\dfrac{3}{2} + i\dfrac{103}{30}$

(b) $\dfrac{1}{2} + i\dfrac{103}{30}$

(c) $\dfrac{-3}{2} + i\dfrac{103}{30}$

(d) $\dfrac{-1}{2} + i\dfrac{103}{30}.$

24. Let R denote the ring of all 2×2 matrices over $\mathbb{Z}$. Choose the correct answer:
    (a) There are only finitely many nilpotent elements of R.
    (b) There are infinitely many nilpotent elements of R.
    (c) The set of nilpotent elements of R is a subgroup of $(R, +)$.
    (d) The set of nilpotent elements of R is an ideal of R.

25. Consider the following assertions:

    1. Every finite subset of a metric space is compact.
    2. Supremum of the set $\{x \in \mathbb{Q} \mid (\sqrt{2}-1)x < \sqrt{2}+1\}$ is $3 + 2\sqrt{3}$.
    3. If lim sup (a_n) = lim inf (a_n), then (a_n) is convergent.

    Which of the following is True ?

    (a) All the statements are Correct.
    (b) Only (1) and (3) are correct.
    (c) Only (1) and (2) are correct.
    (d) Only (1) is correct.

Group B

1. Show that an operator T on a Hilbert space H is normal if and only if $\|T^*x\| = \|Tx\|$ for every $x \in H$. [10]

2. State and prove the convergence condition of fixed-point iterative method for finding the root of $f(x) = 0$. [10]

3. Find the eigenvalues λ's and corresponding eigenfunctions $y_n(x)$ for the equation $y'' + \lambda y = 0$ under the boundary condition $y(0) = 0$ and $y(\pi/2) = 0$. [10]

4. (a) Let $f : X \to Y$. If X is compact and Y is Hausdorff, show that f is a homeomorphism. [6]

   (b) Give an example showing that the conclusion can fail if Y is not Hausdorff. [4]

5. Show that the extremal of the functional $I[y]$,

$$I = \int_0^{x_1} y^2(y')^2 dx$$

   which passes through the points $(0, 0)$ and (x_1, y_1) is a parabola. [10]

6. A university club has 15 members: 8 men and 7 women. They want to form a committee of 6 members. Determine the number of possible committees that can be formed under each of the following conditions:

   (a) At least 3 women must be on the committee. [2.5]

   (b) Two particular members, Alice and Bob, cannot be together. [2.5]

   (c) If Charlie is selected, then David must also be selected. (Assume all are men.) [2.5]

   (d) No more than 4 men can be on the committee. [2.5]

7. Give examples of (i) a non-commutative ring of order 81 and (ii) a commutative ring of order 81. [10]

8. Determine the analytic function $f(z) = u(x, y) + iv(x.y)$, if

$$u + v = \frac{sin2x}{cosh2y - cos2x}$$

   [10]

9. Consider the one-dimensional wave equation

$$u_{tt} - 4u_{xx} = 0, \quad -\infty < x < \infty, \ t > 0,$$

The initial displacement and velocity are given by:

$$u(x,0) = \begin{cases} 1 - x^2, & |x| \leq 1 \\ 0, & \text{otherwise} \end{cases}$$

$$u_t(x,0) = \begin{cases} 4, & 1 \leq x \leq 2 \\ 0, & \text{otherwise} \end{cases}$$

(a) Determine the value of $\lim_{t\to\infty} u(5,t)$. [5]

(b) Identify the set of all points (x,t) in the half-plane $t > 0$ where the solution $u(x,t)$ is continuous. [5]

10. (a) Determine whether

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 0 & 2 & 3 & 4 \\ 0 & 0 & 3 & 4 \\ 0 & 0 & 0 & 4 \end{bmatrix}$$

is invertible or not using elementary row operations and find A^{-1} if it exists. [5]

(b) Show that row-equivalent matrices have the same row space. [5]

11. (a) Let $\{f_n\}$ be a sequence of real-valued functions defined on a metrix space X with pointwise limit f. For each $n \in \mathbb{N}$, define $M_n = sup\{|f_n(x) - f(x) \mid x \in X\}$. Show that $\{f_n\}$ converges uniformly to f if and only if $M_n \to 0$. [4]

(b) Let $X = [0,1]$. For each $n \in \mathbb{N}$, define $f_n \colon X \to \mathbb{R}$ by $f_n(x) = n^2x(1 - x^2)^n$. Find the pointwise limit f and show that the convergence $f_n \to f$ is not uniform. [6]

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