Ph.D. ENTRANCE EXAMINATION, MAY 2018

Time : 3 Hours   Max. Marks : 100

Instructions :

1) Answer **any ten** questions from Part/Section **A** and **B**.
2) **All** questions carry **equal** marks.
3) Candidates should clearly indicate the **Section, Question Number** and **Question Booklet code** in the answer booklet.
4) The candidates are **permitted** to answer questions **only** from the subject that comes under the **faculty** in which he/she seeks registration as indicated in the **application** form.

Name of candidate

Register Number

Answer Booklet Code

Signature of Candidate

Signature of Invigilator

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FACULTY OF SCIENCE

1. **Mathematics**
2. **Physics**
3. **Chemistry**
4. **Botany**
5. **Zoology**
6. **Aquatic Biology & Fisheries**
7. **Biochemistry**
8. **Geology**
9. **Statistics**
10. **Geography**
11. **Psychology**
12. **Demography**

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1. MATHEMATICS

PART – A

Answer **any ten** questions. **All** questions carry **equal** marks.　　　**(10×5=50 Marks)**

1. What are the objectives of research ?

2. Give the difference between experiments and survey.

3. Write a short note on good research .

4. What is the necessity of defining a research problem ? Explain.

5. Write down the importance of literature survey.

6. How do you organize a scientific paper ?

7. "Interpretation is fundamental component of research process". explain, why so ?

8. Write a short note on "Bibliography and its importance in research report".

9. How do you prepare an abstract of a research paper ?

10. How are computers used as a tool in research ?

11. Discuss between Null hypothesis and Alternate hypothesis.

12. What is Chi-square test ? Explain its significance in statistical analysis.

13. What is the need for a sample ?

14. Define the terms-theorem , conjecture and open problem.

15. How to prepare title for a Dissertation ?

PART – B

Answer **any ten** questions. **All** questions carry **equal** marks. **(10×5=50 Marks)**

1. Reduce the quadratic form $2x_1x_2 + 2x_1x_3 - 2x_2x_3$ to the canonical form by an Orthogonal transformation.

2. Obtain the characteristic values of the linear transformation $T : R^2 \rightarrow R^2$, defined by $T(x, y) = (5x + 6y, 3x - 2y)$.

3. Let G be a group with subgroups H and K. If $|G| = 660$, $|K| = 66$ and $K \subset H \subset G$. What are the possible values for $|H|$?

4. Show that every group of order 15 is cyclic.

5. If $f(x) = 3x^5 - 8x^4 + x^3 - x^2 + 4x - 7$, $g(x) = x + 9$ and $f(x), g(x) \in \mathbb{Z}_{11}[x]$, find the remainder when $f(x)$ is divide by $g(x)$.

6. Prove or disprove the statement, "The space of real numbers together with the usual Topology is a Hausdorff space".

7. Prove that the closure of a connected set is connected.

8. Let $\{f_n\}$ be a sequence of continuous functions on R that converges uniformly to f, then show that f is continuous on R.

9. In a Normed linear space, every convergent sequence is a Cauchy sequence. Justify.

10. If E_1 and E_2 are Lebesgue measurable then prove that $E_1 \cup E_2$ is also Lebesgue measurable .

11. If a connected planar graph has nine vertices having degrees 2, 2, 2, 3, 3, 3, 4, 4, 5. How many edges and faces (or regions) are there ?

12. Find the value of $2x^4 + 5x^3 + 7x^2 + 41$, if $x = -2 - \sqrt{3}i$.

13. Show that the function $u = e^{-2xy} \sin(x^2 - y^2)$ is harmonic.

14. Find the image of $|z - 2i| = 2$, under the transformation $w = \dfrac{1}{z}$.

15. Find the bilinear transformation which maps the points $z = 1, i, -1$ into the points $w = i, 0, -i$. Hence find the image of unit disc.

2. PHYSICS

PART – A

Answer **any ten** questions. **(10×5=50 Marks)**

1. Write a short note on formulation of a research problem.

2. Distinguish between quantitative and qualitative research.

3. Write a short note on ethics of research.

4. What do you understand by plagiarism ?

5. Explain briefly about the proposed India-based Neutrino Observatory.

6. Distinguish between precision and accuracy.

7. Write a short note on methods involved in data collection.

8. Write a short note on error analysis.

9. What are the different types of errors involved in an experiment ?

10. A metallic wire 1 mm in diameter carries a charge of 100 Coulombs in one hour. The metal contains 6×10^{22} free electrons per cc. Calculate the current in the wire.

11. The Young's modulus is calculated using the formula $E = \dfrac{Mgl^3}{4bd^3y}$. Derive an expression for maximum percentage error in E in terms of the percentage errors of other parameters.

12. Explain different types of regression.

13. Distinguish between correlation and regression.

14. Explain different ways of presenting the data.

15. Explain results of Michelson Morley experiment and its significance.

PART – B

Answer **any ten** questions. **(10×5=50 Marks)**

16. Prove any two properties of Poisson bracket.

17. State and explain Poynting theorem.

18. Prove that, if g (ω) is the Fourier transform of f (t), then Fourier transform of f(t) cos (ωt) is given by $\frac{1}{2}g(\omega - a) + \frac{1}{2}g(\omega + a)$.

19. Explain Einstein's theory of photoelectric effect.

20. State and explain second law of thermodynamics.

21. State and explain Heisenberg's uncertainty principle.

22. Derive time dependent Schrodinger equation for a free particle in one dimension.

23. Explain the principle of Electron spin resonance spectroscopy.

24. Explain Einstein's coefficients and their significance.

25. Briefly explain the classification of elementary particles.

26. Obtain expressions for most probable speed and root mean sque speed from M.B. distribution law.

27. Distinguish between DC and AC Josephson's effect.

28. Show that reciprocal lattice of BCC lattice is FCC.

29. Explain the working of a zero crossing detector, using OPAMP.

30. Explain different types of pulse modulations and compare them.

3. CHEMISTRY

PART – A

Answer **any ten** questions. **(10×5=50 Marks)**

1. Write a brief account of the primary sources of literature in Chemistry.

2. Taking a specific example discuss the various steps to prepare a review article.

3. What are the web sites available for chemical research ? Discuss.

4. With the help of one example, discuss design of an experiment.

5. What do you mean by 'ethics in research' ? Explain.

6. The following data were obtained for the estimation of Na in a sample. Calculate the mean deviation and standard deviation. Data are in mg 3.120, 3.128, 3.019, 3.124, 3.126.

7. The following data were obtained for x – y plot . Find the slope and interrupt by linear least square method.

$x \times 10^3$	2	4	6	8	10
y	1.86	1.92	2.00	2.08	2.15

8. What is correlation coefficient ? How is it evaluated ? What is the significance of negative values of correlation coefficient ?

9. Distinguish between determinate and indeterminate error. What are the methods of minimising determinate error ?

10. Suppose you have developed a new method of estimation of a componenet. How would you establish the validity of the new method ?

11. A solution shows absorbance A = 2.00 at 480 nm. What percentage of radiation is absorbed by the sample ?

12. Draw mass spectrum of butanone. Discuss the spectrum.

13. Draw TG of calcium oxalate $2H_2O$. Discuss.

14. A particular type of proton absorbs 900 Hz downfield w.r.t. TMS in proton NMR spectrum. Calculate the chemical shift δ (delta). What would be the chemical shift δ in a 500 MHz instrument ? Justify your answer.

15. A piece of diamond of vol. $1m^3$ is divided into small cubes each of volume $1nm^3$. What is the change in surface area ?

PART – B

Answer **any ten** questions. **(5×10=50 Marks)**

16. Discuss bonding in metal carbonyls .

17. Explain the terms high spin and low spin complexes with one example for each.

18. Account for the following :

    a) $KMnO_4$ is intensely colored.

    b) Tetrahedral complexes are intensely colored compared to octahedral complexes.

19. Explain the structure of

    a) Perovskite

    b) Spinel with suitable examples.

20. Account for the following :

    a) NiO is a p-type semiconductor.

    b) Transition metals are used as hydrogenation catalysts.

21. Which of the following molecules show microwave spectrum ? Justify your answer.

    CO_2, COS, NO_2, C_2H_2, CH_3Cl.

22. Assign Schoenflies symbol of point group for the following.

    CH_2Cl_2, ethane (Staggered)

    Cyclohexane (boat form)

    allene, H_2O_2.

23. A particle is confined to one dimensional box of length 'a'. What are the allowed energy values ?

24. For the cell $Zn\left|Zn^{2+}_{a=0.02}\right|\left|Cu^{2+}_{a=0.004}\right|C$. Find the cell potential standard electrode potentials of Zn^{2+} | Zn and Cu^{2+} | Cu are – 0.767 and + 0.343 V respectively. T= 298 K.

25. Show that for the rigid sphere model of bimolecular reactions. Absolute Rate Theory agrees with simple collision Theory.

26. What is Wittig reaction ? Discuss.

27. Using Jablonski diagram, discuss the photophysical processes.

28. Using an example, discuss retrosynthetic method.

29. Discuss stereochemistry of S_{N^1} and S_{N^2} processes.

30. Discuss the applications of ORD in organic structural elucidation.

<div style="border:1px solid">**4. BOTANY**</div>

PART – A

(Research Methodology)

Answer **any ten** questions. Each question carries **five** marks.   **(10×5=50 Marks)**

1. Define Research and explain how qualitative research differs from quantitative research.

2. What is the purpose of a questionnaire ? Why closed questions are preferred to open ended questions in survey research ?

3. What are the methods for data collection ? Explain the terms.
   a) Primary data
   b) Secondary data
   c) Experimental data.

4. Describe the importance of literature survey for identifying scientific problem. Explain with suitable example.

5. How important is the repeatability, reproducibility and reliability of experiment results ? Describe.

6. Suppose you want to do research in some topic and you are approaching government for funding. You are requested to write a research proposal. You will get funding only if your proposal is convincing. Explain the important components of a good research proposal. You may explain using suitable example.

7. What is testing of hypothesis ? Explain how it is useful for illustrating a research problem with two examples.

8. What is Chi-Square test ? Explain its significance in statistical analysis of any research problem. Explain with example.

9. What is Student's T test ? How is it different from analysis of variance ? Explain with suitable examples.

10. Explain the researcher bias and researcher effects.

11. Explain the terms Patent, Copyright, Breeder's right and Trademark.

12. Differentiate between a review paper, a research paper and a brief report.

13. Explain the terms Fabrication, Falsification, Duplicate publication, Plagiarism and self-plagiarism.

14. What is reference citation ? Why is it important ? What are the important features to be covered in a citation ? With suitable examples, explain the difference between citing a paper and a book.

15. Write the important requirements of a good power-point presentation. How is it different from a poster presentation ?

PART – B
Botany

Answer **any ten** questions. **Each** question carries **five** marks.   **(10×5=50 Marks)**

1. What is the endosymbiotic hypothesis about the origin of mitochondria ? What are the molecular facts that support the hypothesis ? To which other celluar organelles the hypothesis can also be applied ?

2. What are zygotic meiosis, gametic meiosis and sporic meiosis ? Give appropriate examples.

3. Describe why the plant life cycle known as the alternation of generations.

4. What plant hormone is remarkable in its ability to stimulate flowering and fruit ripening ? What are the uses and practical setbacks of this hormone ?

5. What are the main natural plant hormones and what are their respective effects ?

6. What are the main features of meristematic cells ? Why do these cells need to have a high mitotic rate ?

7. How are male gametophytes and male gametes formed in angiosperms and gymnosperms ?

8. What do ATP and ADP mean ? What are the roles of these molecules in the energy metabolism of a cell ?

9. Describe various strategies for the conservation of floral biodiversity.

10. Explain the importance of molecular tools in plant taxonomy with suitable examples.

11. What are secondary metabolites ? How are they different from primary metabolites ? Why are they important commercially ?

12. Imagine your neighbor's rice field is severely attacked by a disease. Surprisingly, there is one plant which is not affected. You want to identify the reason for this. Name two techniques used to study the differential expression of the whole transcriptome. What other down-stream experiments can you design to identify the candidate genes responsible for enhanced resistance in the odd plant ?

13. What are biofuels ? What are the sources of biofuels ?

14. Name four techniques in molecular biology that have developed from the basic knowledge of DNA structure, DNA replication and reverse-transcription. Justify your answer with explanation.

15. Name at least two techniques each, used for the following functions :
    a) To detect the presence or absence of a transgene in a plant
    b) To detect copy number of a transgene in an plant
    c) To study the mRNA expression of a transgene
    d) To study the protein expression of a transgene.

5. ZOOLOGY

PART – A

(Research Methodology)

Answer **any ten** questions. **All** questions carry **equal** marks. (10×5=50 Marks)

1. Why should a hypothesis to be formulated before organizing a research programme ?

2. Define variables in research data ?

3. Define the concept of universe.

4. Explain the concept Empirical.

5. Attitude and opinion are two elements in the scientific process.

6. Define objectives in a research programme.

7. Justify "A good research should be free from the researchers personal biases and must be based on objectivity, and not subjectivity".

8. Differentiate quantitative and qualitative research.

9. What are the precautions to be taken in the process of data collection ?

10. Explain multistage sampling.

11. Differentiate a questionnaire and schedules.

12. What is meant by trend curve ?

13. Explain a simple bar diagram/chart.

14. Write short notes on **any** of the following :
    a) Positive and negative correlation
    b) One way, two way ANOVA
    c) Student 't' test
    d) Regression analysis.

15. Explain Mathematical average or mean.

PART – B
Zoology

Answer **any 10** questions. **All** questions carry **equal** marks. **(10×5=50 Marks)**

1. What is the relationship between biodiversity and environmental health ?

2. Give an account of the endocrine system of crustaceans.

3. Differentiate selective medium from differential medium in microbiology.

4. Explain the importance missing links in working out evolutionary sequences.

5. Explain the energy metabolism in having glucose as the energy source.

6. Explain nucleic acid synthetic mechanism.

7. Explain the mechanism of diabetes in man.

8. Explain the theory of natural selection.

9. Give an account of molecular evolution.

10. What are the methods by which Kidney function can be evaluated ?

11. Comment on Human genome project and how can the data generated be used for gene therapy ?

12. Oncogenes are omnipresent. How can then prevent cancer in humans ?

13. Define micro – biome and explain how does this relate with health.

14. Draw the relationship existing between environmental and human health.

15. How do liver function and health are related ?

6. AQUATIC BIOLOGY AND FISHERIES

PART – A

(Research Methodology)

Answer **any 10** questions, **each** question carries **five** marks. (10×5=50 Marks)

1. What are the essential features of a good research design ?

2. State and explain different types of research report.

3. Describe how sub cellular organelles can be separated by centrifugation.

4. Explain the procedure for registration of trade marks. What are the effects of registration of trade mark ?

5. Define Invention. Which Inventions are patentable ?

6. Define F-test and post Hoc test.

7. Discuss the nature of research problem and indicate how an ideal problem is formulated for Research.

8. Explain Research methodology and Literature review.

9. Explain the functions of statistics.

10. Define probability curve.

11. Define Impact factor and H-index.

12. Discuss Pre writing considerations.

13. Define errors in research.

14. Explain IPR and copyrights.

15. Plagiarism and measures to check plagiarism.

PART – B

(Aquatic Biology and Fisheries)

Answer **any 10** questions, **each** question carries **five** marks.   (10×5=50 Marks)

1. Give an account of various maturity stages of fishes.

2. Briefly describe the modern theory of evolution.

3. Write briefly on classification of fishes.

4. Explain the gas exchange mechanism found in fishes.

5. Discuss the potential of Deep sea fishing in India.

6. What do you mean by Reservoir ranching ?

7. What is stake net fishing ?

8. Mention the importance of surplus production method of fish stock assessment.

9. Give an account of fish pheromones.

10. Management of reservoir fisheries.

11. Discuss the threat, conservation measures and conservation issues of the inland fresh water fish resources of India.

12. Discuss the impact of global warming on marine fish resources with special reference to pelagic of India.

13. Write notes on fish migration.

14. Write notes on the life history of the fresh water prawn *Macrobrachium rosenbergii*.

15. Induced breeding in fishes.

7. BIOCHEMISTRY

PART – A

Research Methodology

Answer **any 10** questions. **Each** question carries **5** marks.   (10×5=50 Marks)

1. Explain the objectives and characteristics of research.

2. Write a note on the types of research.

3. What are the criteria of good research ?

4. How do you define a research problem ?

5. List out the techniques involved in the defining of research problem.

6. Explain Research Design.

7. How are samples collected ? Find out the mean and median of

   1.30, 1.37, 1.54, 1.51, 1.50, 1.62, 1.59, 1.51, 1.58, 1.56, 1.56, 1.49 .

8. Write note on measurement tools.

9. Mention the importance of sample size.

10. Write about basic concepts of testing of Hypothesis.

11. Explain Chi-Square test.

12. What is ANOVA ?

13. What is meant by Multivariate analysis ?

14. Explain the role of charts and graphs in statistics.

15. Explain the role of computers in research.

PART – B
Biochemistry

Answer **any ten** questions. **Each** question carries **five** marks. **(10×5=50 Marks)**

1. Explain the structure and properties of peptide bond

2. Write a note on sickle-cell anemia and sickle-cell Hb.

3. Explain key features of active site of an enzyme.

4. Derive Michaelis -Menten equation and state the relationship between K_m and V_{max}.

5. Write a note on the phospholipids ?

6. Explain Glycolysis.

7. Write a note on glycogen-storage diseases.

8. Discuss urea cycle.

9. Explain calvin cycle.

10. Write a note on the breakdown of Heme.

11. Explain the enzyme deficiency that leads to Gout.

12. Discuss the structure and properties of transposons.

13. Write a note on RNA splicing.

14. Explain the structure of t-RNA.

15. Write a note on neurotransmitters.

8. GEOLOGY

PART – A
(Research Methodology)

I. Write short notes on **any ten** of the following.   **(10×5=50 Marks)**
1. Methods of research.
2. Principal component analysis.
3. Multivariate and factor analysis.
4. Analytical techniques.
5. Reference citation
6. Citation Index.
7. Quality of good research.
8. RDBMS.
9. Sample design
10. Importance of research problem.
11. Computer applications in Geology.
12. Plagiarism.
13. Problems encountered by researchers in India.
14. Objectives of research.
15. Data collection.

PART – B
(Geology)

II. Write short notes on **any ten** of the following.   **(10×5=50 Marks)**
1. Drainage network
2. DTM
3. Moho discontinuity
4. Silicate structure
5. Geological time scale
6. Magmatic differentiation
7. Groundwater condition of Kerala.
8. Gas hydrates
9. Saline water intrusion
10. Dharwar Craton
11. Benioff zone
12. Index fossils and its importance
13. Charnockites of south India
14. Sedimentary textures
15. Optical properties of pyroxene group of minerals.

9. STATISTICS

PART – A

Answer **any 10** questions. **Each** question carries **5** marks. **(10×5=50 Marks)**

1. Why does one do research ? What are the different objectives of doing a research ? Explain the characteristics of a good researcher.

2. Explain the difficulties in conducting research.

3. Briefly describe various researching skills.

4. Briefly describe the terminologies "Critical Reading" and "Creative Reading".

5. What is research paradigm ? What are Higher Order Paradigms or Philosophical Paradigms ?

6. Briefly describe the frame work for research in statistics.

7. Why a researcher should build an argument ? What do you mean by hypothesis ? What are different types of hypothesis ?

8. Briefly explain the components of a research process.

9. Explain the importance and steps involved in 'Literature Review Process' associated with any research.

10. Discuss the terminologies 'Experiment' and 'Survey' associated with research. What are the basic principles of experimentation ?

11. Discuss the difference between 'action research' and consultancy'.

12. Briefly explain any two qualitative methodologies of research.

13. What are the important points to be considered while designing a research questionnaire ?

14. Explain the terminology 'Triangulation' associated with the research.

15. What do you understand by participatory practices associated with a research ?

PART – B

Answer **any 10** questions. **Each** question carries **5** marks.   **(10×5=50 Marks)**

1. Examine whether the following function $F(x, y) : R^2 \to R$ is a bivariate cumulative distribution function $F(x,y) = \begin{cases} 0, & \text{if } x+y < 0 \\ 1, & \text{if } x+y \geq 0 \end{cases}$.

2. Let X be a 3-variate normal random vector with mean vector μ and variance covariance matrix Σ given as below :

$$\mu = (2,-2,3)' \text{ and } \sum = \begin{bmatrix} 8 & -2 & -1 \\ -2 & 6 & 5 \\ -1 & 5 & 5 \end{bmatrix}.$$

   Compute the partial correlation coefficient $\rho_{23.1}$ and multiple correlation coefficient $\rho_{2.13}$.

3. Examine the validity of the formula $V(Y_1) = E(V(Y_1|Y_2)) + V(E(Y_1|Y_2))$, for

   $(Y_1, Y_2) \sim N_2((\mu_1, \mu_2), (\sigma_1^2, \sigma_2^2, \rho\sigma_1\sigma_2))$.

4. Let $(X_1, X_2, ..., X_n)$ be a random sample from a continuous distribution $F(x)$. Let $F_n(x) = (1/n)\sum_{i=1}^{n} I[X_i \leq x]$, where I is the indicator function. Compute $E(F_n(x))$ and $Var(F_n(x))$. For $-\infty < x < y < \infty$, derive $Cov(F_n(x), F_n(y))$.

5. Let X_1, X_2, X_3, X_4 be a random sample of size 4 from U (0,1) distribution. Derive the distribution of sample range.

6. State and prove the necessary and sufficient condition for a quadratic form $X'AX$ in X to be chi-square, where, $X \sim N_p(0, \Sigma)$.

7. Discuss how auxiliary information can be used in survey sampling.

8. Consider a sequence of random variables $\{X_n\}$ on $([0,1], \mathcal{F}, P)$, where, P is the Lebesgue measure, X_n is θ defined by $X_n = I_{[0, 1/2+1/n]}$ and the random variable $X = I_{[1/2, 1]}$. Examine the convergence of $\{X_n\}$ to X in distribution and in probability.

9. Determine whether weak law of large numbers holds for the sequence of independent random variables $\{X_n\}$, with

$$P(X_n = 2^n) = 1/2 = P(X_n = -2^n).$$

10. Let Y_i be i.i.d. random variables with distribution $P(Y_i = 1) = P(Y_i = -1) = 1/2$.

Define $X_n = \sum_{i=1}^{n} Y_i / 2^i$ and $\phi X_n(t) = E(e^{itX_n})$. Examine the convergence of $\phi x_n(t)$.

Identify the limiting characteristic function.

11. State Liapunov's and Lindeberg's conditions of the central limit theorem. Show that the former implies the latter.

12. Let $X_1, X_2, ..., X_n$ be a random sample from $N(\mu, \sigma^2)$, where μ is known to be an integer. Find the MLE of μ and σ^2.

13. Let $Y_1, Y_2, ... ,Y_n$ be iid from the uniform distribution on the interval $(0, \theta)$, where θ is in $[1, \infty)$. Find UMVUE of θ.

14. What is fractional factorial design ? Why do they work ?

15. Discuss Probability proportional to size sampling method . Give one application of such a sampling method.

10. GEOGRAPHY

PART – A
Research Methodology

Answer **any 10** questions. **Each** question carries **5** marks. **(10×5=50 Marks)**

1. Differentiate between an interview and questionnaire.
2. What are the errors that occur during geographical data measurement ?
3. Explain the important methods of factor analysis.
4. What is the procedure for collecting secondary data in physical geography research ?
5. Explain various graphical methods of data representation.
6. Differentiate between chorochromatic and choroschematic map.
7. Discuss the steps involved in designing a sample.
8. How Remote Sensing plays an important role in Geographical research ?
9. Explain the importance of secondary data in geographical research.
10. Briefly explain concepts and techniques of "Modifiable Areal Unit Problem (MAUP)".
11. Differentiate between structured interview and unstructured interview.
12. What are the various characteristics of Research ?
13. With suitable examples explain the differences of Chicago and APA style of writing references of report .
14. Explain ordinal and Interval scale in detail.

PART – B
(Geography)

Answer **any 10** questions. **Each** question carries **5** marks. **(10×5=50 Marks)**

1. Write a short note on urban environmental problem for modern cities.
2. Briefly explain the agro climatic zones of India.
3. Illustrate how the geographical factors are responsible for the flourishing of textile industries in India.
4. List out the numerous data error that can happen in finalizing the GIS projects.
5. Describe major koppen's Climatic Classifications.
6. What is that central place theory supposed to explain ?
7. Explain how geographical, socioeconomic and climatic parameters affect Indian Tourism with reference to a study area.
8. Differentiate and Illustrate normal and arid cycle of erosion.
9. What is a gravity model ? Explain the importance of gravity model in geographical studies.
10. What is Image Interpretation ? What are the various image interpretation elements ?
11. Explain overlay analysis with examples.
12. How much important was French's contribution in development of Geography ?
13. Briefly explain with suitable illustrations, the methodology adopted for Land use/land cover analysis of a region.
14. Define Demographic Transition Theory. Explain its Causes and Consequences.
15. Define Tropical Cyclone and illustrate, briefly the Development of a Tropical cyclone.

11. PSYCHOLOGY

PART – A
(Research Methodology)

Write short notes (within **200** words) on **any 10** of the following topics. **Each question carries 5 marks.**   **(5×10=50 Marks)**

1. Levels of measurement
2. Ethics in reporting research
3. Hypotheses
4. Observational research
5. Probability sampling
6. Criterion related validity
7. Between-subjects designs
8. Factorial design
9. Single subject design
10. Non-parametric tests
11. Partial correlation
12. Simple linear regression
13. Content analysis
14. Focus group discussions
15. Parts of research paper.

PART – B
(Psychology)

Write short notes (within **200** words) on **any 10** of the following topics. **Each question carries 5 marks.**   **(5×10=50 Marks)**

1. Neuroplasticity
2. Perceptual organization
3. Latent learning
4. Forgetting
5. Explanatory styles
6. Moral development
7. Stages of creative process
8. Projective tests
9. Cognitive dissonance
10. Mental Status Examination
11. Behaviour modification
12. Family therapy
13. Peace psychology
14. Psychoneuroimmunology
15. Internet addition.

12. DEMOGRAPHY

PART – A

(Research Methodology)

Answer **any ten** questions. **All** questions carry **equal** marks. **(10×5=50 Marks)**

1. Discuss the major steps in social science research.
2. Describe the important aspects embodied in a research design.
3. Write short note on any three of the following :
   a) Qualitative research
   b) Case study.
4. Differentiate between pure and applied research.
5. Discuss the interplay between the theory and fact.
6. How one can assess the reliability and validity of measurements ?
7. Formulation of research problem – Explain.
8. Explain different sampling technique and discuss the advantages of Sampling.
9. Define Hypothesis and write the importance of Hypothesis.
10. Elucidate the different types of Data sources.
11. How to differentiate Qualitative and Quantitative methods of data collection ?
12. Mention different Scales of measurement.
13. Explain Chi-square test and its advantages and limitations.
14. Methodological issues for Population health research – discuss.
15. Describe the steps of prepare Research Report in social research.

PART – B

(Demography)

Answer **any ten** questions. **All** questions carry **equal** marks. **(10×5=50 Marks)**

16. Define Demography, mention its scope and nature.
17. Distinguish between Fertility and Fecundity and discuss two different types fertility measure.
18. Describe the factors responsible for low fertility in Developed countries.
19. What are the possible causes and consequence of population growth in the developing regions ?
20. Narrate the Proximate determinate of fertility.
21. Explain Population Stabilization.
22. Define Infant Mortality and explain the components of IMR.
23. Describe Demographic Transition Theory and its relevance now.
24. Discuss Life Table.
25. What do you understand by "Diffusion and Cultural lag" on population ?
26. Explain Basic Measure of Mortality.
27. Millennium Development Goal – Explain.
28. Discuss the types of Migration and examine the factors affecting the population distribution.
29. Explain the linkage between Women status and Fertility level.
30. Discuss in detail on Malthusian theory on population and its relevance to the population situation of India.

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