Department of Physics
Aliah University

Ph.D. Course Work Examination- 2025 (January)

Paper Code: PhD/RPE-02 Paper Name: Research and Publication Ethics

Full Marks: 40 Time: 2 hrs

[Use separate answer script for each group]

Group-A

Answer Question No. 1 & Any Five from Others *[5 + (5X4) = 25]*

1. Write the full form: (a) ISSN, (b) COPE, (c) SNIP, (d) JCR, (e) ORCID, (f) SCI, (g) DOI, (h) DOAJ, (i) UGC-CARE, (j) CPOE.
2. What do you mean by *h-index*, *g-index* and *i10-index* of a researcher or a journal? Give example how these index are calculated. [2+2]
3. What do you mean by plagiarism? Briefly discuss about (a) complete plagiarism/intellectual theft, (b) source-based plagiarism, (c) verbatim plagiarism, and (d) self plagiarism. [1+3]
4. In case of "publication ethics", briefly discuss about some of the international ethics codes: (a) integrity, (b) honesty, (c) objectivity, (d) responsible publication/duplicate publication, and (e) respect for intellectual property.
5. To get authorship in a research paper, write at least three important contributions/criteria. What do you mean by (a) corresponding author, (b) guest author and (c) gift authorship? [2+2]
6. Distinguish between UGC CARE-I and CARE-II journals. Name four international journal database or researcher database for indexing. [2+2]
7. For a research journal, what are the 'Impact Factor' and 'CiteScore'? With example, discuss how one can calculate IF and CiteScore. [2+2]
8. (a) Give some examples on 'conflict of interest' which may arise in research and publication.
   (b) Write about 'Data availability statement' given in a manuscript for publication. [2+2]
9. (a) Write four names of Plagiarism checking software, including UGC prescribed software.
   (b) Write the UGC prescribed four types of levels of plagiarism and respective penalties for PhD thesis/dissertation. [2+2]
10. (a) When we check similarity for plagiarism, write the components which we can exclude from plagiarism checking?
    (b) Write few guidelines prescribed by UGC for curbing plagiarism in HEIs. [2+2]

Group-B

Answer Any Three Questions *[3X5 = 15]*

1. Discuss the concept of *Open Access* publishing. In this context, what do you mean by Article Processing Charge (APC)? Indicate the stage of publication, when payment of APC is required from the author's end. In which cases, the journal houses offer discount on APC? [2+1+1+1]
2. Define Predatory journals and publishers. Cite a few examples in your research area. [3+2]
3. What are the essential features of the software tool to identify predatory publications developed by SPPU? [5]
4. Discuss on an arXiv publication. Can you submit an arXiv publication to a peer-reviewed journal for publication? [4+1]
5. What do you mean by publication misconduct? What are the steps for its identification? [3+2]

Department of Physics
Aliah University
PhD Course Work Examination- 2024-2025 (January-2025)

Paper Code: PHD/RM-01 **Paper Name:** Research Methodology
Full Marks: 80 **Time:** 3 hrs

[Use Separate Answer Scripts for Each Group]

Group-A
Answer Any Five Questions [5x5=25]

1. Define 'research', 'research methods' and 'research methodology'? Give example for each.
2. (a) What do you mean by citation? What are the components of a Journal Reference? Write any citation/reference using APA and Chicago styles for a (i) published article and (ii) book.
   (b) Write at least three names of website/source of reference to search/collect references/cross-references.
3. (a) Distinguish between 'qualitative research' and 'quantitative research'. Give examples. (b) What is applied research?
4. Briefly point out various stages of research (cycle of research) to execute a research problem (*i.e.*, from selection of research topic to publication/report).
5. (a) Write few important objectives for research. (b) What is research hypothesis? (c) How do you assess whether the defined problem as a Good Problem?
6. What is a patent? What can be patented? What are the parts of a patent application?
7. Distinguish between Oral Presentation and Poster Presentation. What are the important points/components to be given in PPT for making a good Oral Presentation?

Group-B
Answer Any Four Questions [4x5=20]

1. Discuss about the *front matters* of a prototype Ph.D thesis.
2. What is the typical timeframe of a funded Major research project? Give a brief outline of writing a Major project proposal to a Government agency for funding. Is there any provision for JRF position in a Minor project? [1+3+1]
3. Name three International peer-reviewed journals dedicated to publishing only cutting-edge short articles and two International peer-reviewed journals dedicated to publishing only review articles. Distinguish between single-blind and double-blind peer-review process. [3+2]
4. Cite the advantages of the bibliographic application software "Mendeley". Which publishing house developed and managed this software? [4+1]
5. What are the key features (at least five) of the .tex processing application software "Overleaf"?
6. For a typical scientific article/research article, write all components of the article (from Title to References). When Appendix section and Supplementary material are given in an article? [3+2]

Group-C

Answer All Questions [3+(1+3)+4+(1+3)=15]

1. What do you mean by the terms "precision" and "accuracy"? Give appropriate examples.

   OR,

   Write down the Linux commands to accomplish the following tasks: (i) listing files and folders in the working directory; (ii) Copy content of the "oldfile" to "newfile"; (iii) Turn off the computer.

2. Which numerical techniques are generally employed to find the root(s) of a polynomial equation? Write a FORTRAN code to implement any suitable numerical technique to find the root of the polynomial $f(x) = x^3 - 2x + 3$.

3. Write a program in FORTRAN to evaluate the integral $\int_0^{\pi} 2xSin(3x)dx$ using a suitable numerical algorithm.

   OR,

   Write a FORTRAN program to find the sum of two 3x3 matrices.

4. Explain with suitable figure Runge-Kutta fourth order method of solving differential equation numerically. Hence, write a program in FORTRAN to implement Runge-Kutta fourth order method to find the solution of the second order differential equation $2\frac{d2y}{dx2}+5x\frac{dy}{dx}-6x^2y=6x^3$, at $x = 0, y = 1, \frac{dy}{dx} = 0.5$

Group-D

Answer All Questions

1. Make the tables as per **Annexure-I** using LaTex and mention the appropriate packages that are used to create these tables. [5+5]
2. Create the document (attached as **Annexure-II**) using LaTex. Send both the .tex and .PDF file to the concerned teacher via email (as ZIP or RAR file). [10]

Annexutre-I

Make the following tables using Latex with appropriate packages: 5+5

Name	Mathematics	Physics	Chemistry
Robin	80	68	60
Julie	72	62	66
Robert	75	70	71

S.No	Scientist	Discovery	Description
1	Einstein	$E = mc^2$	This is Einstein's Mass energy relation
2	Issac Newton	$F = G\frac{M_1 M_2}{r^2}$	This is Newtons's law of gravitation

Aliah University

Department of Physics

Ph. D. Course Work Examination - 2024

Subject: General Relativity and Astrophysics
Full Marks: 80

Subject Code: Ph.D./SP-04
Time: 3 hrs

Answer any FIVE questions.

1. What is Polytropic stars ? Evaluate the Lane-Emden equation for these polytropes and solve it analytically. Using these equations calculate also the Chandrashekhar mass limit for white dwarf stars. 2+9+5

2. Assuming the static spherical symmetric space-time find the Einstein's law of Gravitation in empty space i.e. Schwarzschild solution. 16

3. (a) Stating from the Boltzmann's equation in stellar structure explain Saha's Ionization equation.
   (b) What is Jean's mass ? During star formation calculate the Jean's criteria for the self gravitational isothermal gas cloud . 8 2+6

4. What is Gravitational Lensing? Explain briefly how you will get two images of a source star by using the lens equation. Also, discuss about the brightness of the two images. 3+7+6

5. Why a Black hole radiates ? Estimate the energy of the radiated particles. Write down the laws of Black hole thermodynamics and explain it. 3+7+6

6. A photon from a distant star that reaches earth after just grazing the surface of the Sun will have $r_c \approx$ distance of the closest approach $\approx$ the Sun's radius (6.96.000 Km). Show that the predicted deflection (classically) of a photon passing near the sun's edge is 0.87 seconds of arc. Show also that such a photon actually deflected through an angle of about 1.74" which is just double of the classical result. 8+8

7. (a) What do you mean by H-R diagram ? Briefly explain the diagram. 2+4
   (b) Why do the stars shine ? Discuss hydrostatic equilibrium and radiative equilibrium of a main sequence star. Discuss also about the Mass-Luminosity relation for the stars. 2+5+3

8. (a) What are the physical meaning of the scale factor a(t) and the parameter k in the Robertson-Walker metric? Draw a schematic diagram showing the behavior of the scale factor a(t) for various values of k in the cosmological model (with zero cosmological constant). 3+3
   (b) What is cosmological redshift? Derive the relation between the scale factor and the redshift parameter z. 2+8