



# GANDHI INSTITUTE OF TECHNOLOGY AND MANAGEMENT (GITAM)

(Deemed to be University)

(Estd. u/s 3 of the UGC Act, 1956), NAAC Accredited with 'A+' Grade

Visakhapatnam | Hyderabad | Bengaluru

## GITAM Institute of Science

Department of Physics & Electronics

PhD Entrance Test 2020-21

Model-Question paper

Duration: 2 hours

Max Marks 140

**Note: This is a sample paper. The main examination paper will be online and consists of 35 questions each in section A and section B**

### Section A: Research Methodology

1. Research is
  - a. ability to teach a given topic
  - b. obtaining information in a particular field
  - c. ability to analyze
  - d. a scientific and systematic data collection and analysis
2. Which of the following is the first step in starting the research process?
  - a. Searching sources of information to locate problem.
  - b. Survey of related literature
  - c. Identification of problem
  - d. Searching for solutions to the problem
3. Which of the following regarding research is true
  - a. Its, defining problems, formulating hypothesis or suggesting solutions;
  - b. Collecting, organizing and evaluating data;
  - c. Making deductions and reaching conclusions
  - d. All the above
4. The purpose of research is best described as
  - a. Formulating questions and finding answers
  - b. Discovering lacunae in available knowledge
  - c. Obtaining data by observation or experiments
  - d. Identifying pertinent questions and obtaining answers through the application of scientific procedures.
5. Research design strategy encompasses all of the components below except \_\_\_\_\_.
  - a. data collection design
  - b. sampling design
  - c. instrument development
  - d. data analysis
  - e. all of the above are part of the design strategy

6. Research design strategy encompasses all of the components below except \_\_\_\_.
- data collection design
  - sampling design
  - instrument development
  - data analysis
  - all of the above are part of the design strategy
7. Which one of the following is not true of the Descriptive research
- Research carried out to using questionnaires and survey
  - Researcher has control over the variables
  - Study is only observation and data collection
  - Study is used to assess the states of affairs, for a particular object
8. What purpose do clearly stated objectives serve
- state clearly how the research will be done and what conclusions are expected
  - state clearly what the research intends to contribute and justifies the research being carried out
  - state clearly what the research intends to contribute and details how the research will be done
  - states clearly in detail how research will be done and justify why research is being carried out
9. Taking the idea that the more under stress a person is the more he is depressed, who would be the correct hypothesis
- people under more stress are likely to be less depressed
  - greater stress is associated with low levels of depression
  - stress is positively linked with depression
  - none of these
10. "Individuals who face malnutrition as a child show low immunity" If this is the alternate hypothesis, which of the below statements would be the correct null hypothesis?
- Individuals who face malnutrition as a child show high immunity.
  - Individuals who are well nourished as a child show low immunity"
  - Individuals who face malnutrition as a child have similar immunity as, well nourished ones.
  - None of the above

### Section B: Physics

1. Using Hund's rule the total J for electronic ground state of the N atom is
- 1/2
  - 3/2
  - 0
  - 1
2. Coordination number in FCC unit cell.
- 6

- b. 12
- c. 8
- d. 14

3. If the generating function has the form  $F=F(q_k, P_k, t)$  then

- a.  $p_k = \frac{\partial F}{\partial q_k}, Q_k = \frac{\partial F}{\partial P_k}$
- b.  $p_k = -\frac{\partial F}{\partial q_k}, Q_k = \frac{\partial F}{\partial P_k}$
- c.  $p_k = \frac{\partial F}{\partial q_k}, Q_k = -\frac{\partial F}{\partial P_k}$
- d.  $p_k = -\frac{\partial F}{\partial q_k}, Q_k = -\frac{\partial F}{\partial P_k}$

4. If  $L_x, L_y$  and  $L_z$  are respectively the x, y and z components of angular momentum operator L. The commutator  $[L_x L_y, L_z] =$

- a.  $i\hbar(L_x^2 + L_y^2)$
- b.  $i\hbar(L_x^2 - L_y^2)$
- c.  $\hbar(L_x^2 + L_y^2)$
- d.  $i(L_x^2 + L_y^2)$

5. If the Poisson's bracket of a function with the Hamiltonian vanishes,

- a. the function depends upon time
- b. the function is constant of motion
- c. the function is not the constant of motion
- d. none of the above

6. In case of a rigid body, having N particles, the number of degrees of freedom is

- a. N
- b. 3N
- c. 3
- d. Infinity

7. A hydrogen atom radiates a photon as it falls from a 2p level to the 1s level. The wavelength of the emitted radiation equals

- a. 22.8nm
- b. 91.2nm
- c. 121.6nm
- d. 182.4nm

8. For real atomic orbitals with quantum numbers  $n, l$  the total number of nodal surfaces, radial plus angular, equals

- a.  $n$
- b.  $n-1$
- c.  $n-l-1$
- d.  $n+l$

9. The expectation value of  $1/r$  in the ground state of the hydrogen atom equals

- a.  $a_o$
- b.  $\frac{3}{2}a_o$
- c.  $\frac{a_o}{4\pi}$
- d.  $\frac{1}{a_o}$

10. Luminescence is because of

- a. Photons emitted while excited electrons drop down
- b. Knocking out of electrons by photons
- c. Photons stimulated by photons
- d. All the above