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 Mathematics

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

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7. Which one of the following is not true of the Descriptive research
a. Research carried out to using questionnaires and survey
b. Researcher has control over the variables
c. Study is only observation and data collection
d. Study is used to assess the states of affairs, for a particular object

8. What purpose do clearly stated objectives serve
a. state clearly how the research will be done and what conclusions are expected
b. state clearly what the research intends to contribute and justifies the research being carried out
c. state clearly what the research intends to contribute and details how the research will be done
d. 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
a. people under more stress are likely to be less depressed
b. greater stress is associated with low levels of depression
c. stress is positively linked with depression
d. 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?
a. Individuals who face malnutrition as a child show high immunity.
b. Individuals who are well nourished as a child show low immunity"
c. Individuals who face malnutrition as a child have similar immunity as, well nourished ones.
d. None of the above

Section B: Mathematics

1. The differential equation y$\frac{dx}{dy}$+1=y, y(0)=1, has

a. a unique solution
b. two solutions
c. infinite number of solutions
d. no solution

2. y=cx-c^2 is the general solution of the differential equations

a. $(y^1)^2 - xy^1$ +y=0
b. $y^{11} = 0$
c. $y^1 = c$
d. $(y^1)^2 + xy^1$ +y=0

3. The differential equation $(x + x^8 + ay^2)dx + (y^8 - y + bxy)dy = 0$ is exact if

a. a=b

b. b=2a
c. a≠b
d. a=1, b=3

4. Solution of $(x^2 + y^2)dy=xydx$ is

a. $\log x + c = \frac{x^2}{2y^2}$
b. $\log y + c = \frac{x}{2y^2}$
c. $\log y + c = \frac{x^2}{y}$
d. (d) $\log y + c = \frac{x^2}{2y^2}$

5. Integrating factor of the differential equation $\frac{dx}{dy}+\frac{3x}{y} = \frac{1}{y^2}$ is

a. e^{y^3}
b. y^3
c. x^3
d. $- y^3$

6. The set $V = \{(x, y) \in R^2/xy \geq 0\}$ is

a. a vector subspace of R^2
b. not a vector subspace of R^2 since every element does not have and inverse in *V*
c. not a vector subspace of R^2since it is not closed under scalar multiplication
d. not a vector subspace of R^2 since it is not closed under vector addition

7. An example of a set of linearly dependent vectors in R^3 is

a. $\{(1,1,1),\ (0,1,1),\ (0,0,1)\}$
b. $\{(1,-1,1),\ (0,1,-1),\ (0,0,1)\}$
c. $\{(1,-1,1),\ (0,1,1),\ (3,-8,-2)\}$
d. $\{(1,1,-1),\ (0,-1,1),\ (3,8,8)\}$

8. In R^3 let $V_1 = (1,-1,1), V_2 = (2,-2,0), V_3 = (1,1,0)$. Consider the following 3 statements

A. V_1, V_2, V_3 are linearly independent
B. V_1, V_2, V_3 are mutually orthogonal
C. V_1, V_2, V_3 are linearly dependent vectors each of length 1. Then

a. All three statements are false
b. A is false but B and C are true
c. A is true but B and C are false
d. A and B are true, but C is false

9. To obtain a basis of R^4 one needs to take along with the vectors $(1,1,-1,-1)$, $(1,0,1,0)$, $(0,1,0,1)$ the vector

a. $(1,1,0,0)$
b. $(0,0,1,1)$

c. $(0, 1, 1, 2)$
d. $(1, 1, 0, 2)$

10. Consider the vector space R^3 and the maps $f, g: R^3 \to R^3$ defined by $f(x, y, z) = (x, |y|, z)$ and $g(x, y, z) = (x + 1, y - 1, z)$. Then

a. both *f* and *g* are linear
b. neither *f* nor *g* is linear
c. *g* is linear but not *f*
d. *f* is linear but not *g*