

UPES SAP ID No.: _____



**UNIVERSITY OF PETROLEUM AND ENERGY
STUDIES**

Examination, July 2020

Programme: B.Tech GSE
Course Name: Hydrogeology
Course Code: PEGS 2022
No. of page/s: 09

Semester : IV
Max. Marks : 100
Attempt Duration : 2 Hrs.

Note:

1. Read the instruction carefully before attempting.
2. This question paper has two section, Section A and Section B.
3. There are total of seven questions in this question paper. **One** in **Section A** and **six** in **Section B**
4. **Section A** consist of multiple choice based questions and has the total weightage of 60%.
5. **Section A** will be conducted online on BB Collaborate platform
6. **Section B** consist of long answer based questions and has the total weightage of 40%.
7. The maximum time allocated to **Section A** is two Hrs.
8. **Section B** to be submitted within 24 hrs from the scheduled time (*exceptional provision due extraordinary circumstance due to COVID-19 and due to internet connectivity issues in the far-flung areas*).
9. No submission of **Section B** shall be entertained after 24 Hrs.
10. **Section B** should be attempted after **Section A**
11. **The section B** should be attempted in blank white sheets (hand written) with all the details like programme, semester, course name, course code, name of the student, Sapid at the top (as in the format) and signature at the bottom (right hand side bottom corner)
12. Both section A & B should have questions from entire syllabus.
13. The COs mapping, internal choices within a section is same as earlier

Section – A (Attempt all the questions) (60 × 1 marks)

1. The study of water flow in aquifers and the characterization of aquifers is called
 - a) Hydrology b) Hydrogeology c) Geology d) Geophysics
2. Groundwater storage in term of groundwater annual fluctuation (G), involved Aquifer area (A) and specific yield (S) can be expressed as:
 - a) GAS b) GA/S c) GS d) GS/A
3. An aquifer with hydraulic gradient (i) of 0.1, aquifer length (w) 90 m, and transitivity (T) of 100 cu-m per day per m, will have the ground water flow about
 - a) 90 cu-m per day b) 900 cu-m per day c) 9 cu-m per day d) 9000 cu-m per day
4. Ground water is known as ... resource of the Earth?
 - a) Replenishable b) scarce c) evenly distributed d) infinite
5. The greatest use of ground water in India is
 - a) Urban water supply b) rural water supply c) industry d) agriculture
6. Remote sensing is used in groundwater study for investigation of Earth's
 - a) Surface b) sub surface c) aquifer d) none of these
7. Ground water legislation is needed for
 - a) check indiscriminate draining of ground water b) check pollution of ground water c) deprive poor from use of ground water d) all are these
8. A perched water table
 - a) May lie below ground water table b) may lie above ground water table c) gives a fair amount of sustained yield d) None of these
9. Porosity is significant in the water storage function of rock (T/F)
10. Moisture content of a soil can exceed porosity (T/F)
11. Clay cannot hold as much water as sand can (T/F)
12. The specific retention of a formation is more than its porosity (T/F)
13. A Spring may be formed when a sloping permeable bed is
 - a) always well below ground level with no interruptions b) interrupted by a dyke c) interrupted by an impermeable bed due to presence of a fault d) interrupted by naturally sloping ground surface
14. Permeability is defined as
 - a. the ability of a solid to allow fluids to pass through
 - b. the process by which plants release water vapor to the atmosphere
 - c. the amount of water vapor in the air relative to the maximum amount of water vapor the air can hold.
 - d. the percentage of pore space in the rock
15. The lowering effect on the water table about the base of the well stem is called a(n):

- a. aquiclude
 - b. artesian surface
 - c. cone of depression
 - d. speleothem
16. What is the term for a relatively impermeable geologic unit?
- a. an artesian
 - b. an aquiclude
 - c. an aquifer
 - d. none of these
17. Hard water contains large amounts of
- a. lead
 - b. sodium
 - c. calcium
 - d. silicon
18. Most of the water coming out of continental hot springs is
- a. rain water
 - b. magmatic water
 - c. seawater
 - d. metamorphic water
19. The lowering effect on the water table about the base of the well stem is called a(n):
- a. aquiclude
 - b. artesian surface
 - c. cone of depression
 - d. speleothem
20. Which of the following materials has the lowest porosity?
- a. shale
 - b. gravel
 - c. granite
 - d. sandstone
21. Select all reservoirs that holds the more amount of water than groundwater aquifer?
- a. Atmosphere.
 - b. Glaciers.
 - c. Ocean
 - d. Streams
22. What powers the hydrologic cycle?
- a. Earthquakes.
 - b. Gravity.

- c. Internal heat.
 - d. Solar energy
23. What is water soaking into the ground called?
- a. Evaporation.
 - b. Infiltration.
 - c. Precipitation.
 - d. Recharge.
24. What is alluvium?
- a. Any stream-deposited sediment.
 - b. Bed load sediments.
 - c. Dissolved sediments.
 - d. Suspended sediments.
25. In which part of the groundwater system are the pore spaces filled with water?
- a. Hydraulic gradient.
 - b. Water table.
 - c. Zone of aeration.
 - d. Zone of saturation
26. To what level will a well fill when drilled into the confined aquifer?
- a. Capillary fringe.
 - b. Hydraulic gradient.
 - c. Water table.
 - d. Piezometric surface
27. What is an artesian well?
- a. A free-flowing well
 - b. A spring.
 - c. A very deep well.
 - d. Any well where water rises above the aquifer itself
28. What can form when the pressure surface is above the ground?
- a. A dried up well.
 - b. A flowing artesian well.
 - c. A non-flowing artesian well.
 - d. Influent streams
29. Drinking water having less than 500 TDS is also known as
- a. potable water
 - b. groundwater
 - c. surface water
 - d. artesian water

30. Which problem is caused by groundwater withdrawal?
- Chemical contamination.
 - Drying up of springs.
 - Salt-water incursion.
 - None of these
31. Directional hydraulic conductivities value in isotropic formation will have
- 1:2:3
 - 2:3:4
 - 2:4:6
 - 4:4:4
32. Mass inflow rate – Mass outflow rate = Change of mass storage with time is known as
- Darcy equation
 - Continuity equation
 - Laplace equation
 - Jacob equation
33. $S \cdot dh/dt$ term in governing groundwater flow equation is 0, if aquifer is
- Confined and steady flow
 - Confined and unsteady flow
 - Unconfined and steady flow
 - All are correct
34. The Dupuit-Forchheimer (D-F) assumptions for an unconfined flow system are
- Flow lines are assumed to be horizontal
 - Flow lines are assumed to be radial
 - The hydraulic gradient is assumed to be equal to the slope of the water table
 - hydraulic gradient is independent of slope of the water table
35. 2D unconfined steady-state groundwater flow equation for homogeneous and isotropic is
- Darcy equation
 - Continuity equation
 - Laplace equation
 - Jacob equation
36. The most suitable material in well design is
- Brass metal
 - Stainless steel
 - Cupro-Nickle
 - All are equally good
37. Basic Assumptions for Analyzing steady state Flow to Well is/are
- All flow is radial towards the well.
 - Groundwater flow is horizontal.
 - Darcy's law is valid
 - Geologic formations are of finite horizontal extent
38. This assumption(s) for Groundwater Flow to Well is/are
- Groundwater flow to the pumping well is under steady-state condition.

- b. There is source/sink of recharge to the aquifer.
 - c. The aquifer is compressible
 - d. The well is pumped at a constant rate
39. Basic Assumptions for Analyzing steady state Flow to Well is/are
- a. All flow is radial towards the well.
 - b. Groundwater flow is horizontal.
 - c. Darcy's law is valid
 - d. Geologic formations are of finite horizontal extent
40. The most widely used type of a deep state tube well in India is
- a. Cavity well
 - b. Strainer tube well
 - c. Slotted pipe gravel packed tube well
 - d. Both cavity and strainer tube well
41. T Which of the following tubewell is suitable when a deep bearing stratum lies below an impervious layer and water contribution can take place through bottom only?
42. Strainer type tubewell
43. Abyssinian tubewell
44. Cavity type tubewell
45. Slotted type tubewell assumption(s) for Groundwater Flow to Well is/are
- a. Groundwater flow to the pumping well is under steady-state condition.
 - b. There is source/sink of recharge to the aquifer.
 - c. The aquifer is compressible
 - d. The well is pumped at a constant rate
46. Which ion is found to be abundant in Brine water?
- a. Fluoride
 - b. Chloride
 - c. Calcium
 - d. Magnesium
47. Electrical resistivity method is not useful for---
- a. Aquifer water quality
 - b. Aquifer Mass
 - c. Aquifer depth
 - d. Aquifer thickness
48. Sodium Ions not used in quality check for agriculture water is
- a. Calcium
 - b. Potassium
 - c. Arsenic
 - d. Magnesium
49. Water well can be categorized as
- a. recharge wells
 - b. drainage wells
 - c. monitoring well
 - d. all of the mentioned

50. Find the odd type of well
- Unlined well
 - pervious lining well
 - artesian well
 - dug well
51. According to Dupuit's theory, the velocity of flow is proportional to _____
- Sine of hydraulic gradient
 - Tangent of hydraulic gradient
 - None of the mentioned
 - All of the mentioned
52. The co-efficient of transmissibility (T) with aquifer thickness (b) and hydraulic conductivity (K) is given by which of the following equation?
- $T=b K$
 - $T=b/K$
 - $T=(b K)/2$
 - $T=K/b$
53. Which of the following is depicted by Dupuit's theory?
- The velocity of flow
 - Co-efficient of transmissibility
 - Radial flow of water
 - Volume of aquifer
54. Dupuit's theory was later modified by :
- Thiem
 - Darcy
 - Alam Singh
 - Louden
55. Specific yield of unconfined aquifer indicates:
- Water capacity
 - Volume of water
 - Water retained
 - All of the mentioned
56. The value of specific yield SY, of an aquifer depends on
- Grain size
 - Compaction of stratum
 - Grain shape
 - All of the mentioned
57. The numerical method for solving the differential equation by approximating them by difference equation is called
- Finite volume
 - Finite difference
 - Finite element

d. None of these

58. Industrial waste dumping on ground may affect the groundwater quality of aquifer (T/F)

59. The most popular configuration of electrical survey for groundwater prospecting in India is

a. Wenner

b. Schlumberger

c. Dipole-dipole

d. Pole-pole

60. To solve the FEM problem, it subdivides a large problem into smaller, simpler parts that are called

a. Finite elements

b. Infinite elements

c. Dynamic elements

d. Static elements

SECTION B

Answer all questions. Each question carry 10 marks.

1. Demonstrate the steady state flow equation and its application in confined aquifer
2. Analyze the suitability of pumping test analysis in understanding the sustainability of pumping well for long term use in supply of water for agriculture purpose.
3. Evaluate the various methods of drilling of water well and also illustrate their merits/demerits
4. Critically analyze the design of water well and summarize the advantages/disadvantages of open well vs bore well