

THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA, VADODARA

Ph. D. ENTRANCE TEST (PET) – 7<sup>th</sup> August 2022

Signature of Invigilator

Paper - II

Roll.  
No.

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Civil Engineering/WREMI

(22/35)

Maximum Marks: 50

No. Of Printed Pages: 8

**Instruction for the Candidate:**

1. This paper consists of **FIFTY (50)** multiple choice type questions. Each Question carries **ONE (1)** mark.
2. There is no Negative Marking for Wrong Answer.
3. A separate OMR Answer Sheet has been provided to answer questions. Your answers will be evaluated based on your response in the OMR Sheet only. No credit will be given for any answering made in question booklet.
4. Defective question booklet or OMR if noticed may immediately replace by the concerned invigilator.
5. Write roll number, subject code, booklet type, category and other information correctly in the OMR Sheet else your OMR Sheet will not be evaluated by machine.
6. Select most appropriate answer to the question and darken appropriate oval on the OMR answer sheet, with black / blue ball pen only. **DO NOT USE PENCIL** for darkening. In case of over writing on any answer, the same will be treated as invalid. Each question has exactly one correct answer and has four alternative responses (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item.  
**Example:** (A) (●) (C) (D) where (B) is correct response.
7. Rough Work is to be done in the end of this booklet.
8. If you write your Name, Roll Number, Phone Number or put any mark on any part of the OMR Answer Sheet, except for the space allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means, such as change of response by scratching or using white fluid, you will render yourself liable to disqualification.
9. Calculators, Log tables any other calculating devices, mobiles, slide rule, text manuals etc are **NOT** allowed in the examination hall. If any of above is seized from the candidates during examination time; he/ she will be immediately debarred from the examination and corresponding disciplinary action will be initiated by the Center Supervisor as deemed fit.
10. **DO NOT FOLD** or **TEAR** OMR Answer sheet as machine will not be able to recognize torn or folded OMR Answer sheet.
11. **You have to return the OMR Answer Sheet to the invigilator at the end of the examination compulsorily** and must not carry it with you outside the Examination Hall. You are however, allowed to carry original question booklet on conclusion of examination.



## Paper - II

### Civil Engineering/WREMI (22/35)

**Note:** This paper contains **FIFTY (50)** multiple-choice questions. Each Question carries **ONE (1)** mark.

- 01) The alkalinity and the hardness of a water sample are 250 mg/L and 150 mg/L as CaCO<sub>3</sub>, respectively. The water has
- A) 250 mg/L carbonate hardness and zero non-carbonate hardness.
  - B) 150 mg/L carbonate hardness and zero non-carbonate hardness.
  - C) 250 mg/L carbonate hardness and 150 mg/L non-carbonate hardness.
  - D) 250 mg/L carbonate hardness and 100 mg/L non-carbonate hardness.
- 02) Sodium hypochlorite dosing is done sometimes in aeration tank of activated sludge process to
- A) decrease COD
  - B) improve aeration
  - C) improve biodegradability
  - D) control bulking of activated sludge
- 03) The correct match of the column I with column II is
- | <b>Column I</b>  | <b>Column II</b>            |
|--|-----------------------------|
| P. Slow sand filter  | 1. Flocculant settling      |
| Q. Removal of colloidal and dissolved organic matter from sewage | 2. Smutzdecky formation     |
| R. Type II settling  | 3. Attached growth process  |
| S. Trickling filter  | 4. Activated sludge process |
|  | 5. Backwashing              |
- A) P-3, Q-4, R-2, S-5
  - B) P-2, Q-1, R-4, S-3
  - C) P-2, Q-4, R-2, S-3
  - D) P-2, Q-4, R-1, S-3
- 04) Most predominant form of dissolved nitrogen species in sewage treated by extended aeration activated sludge process will be:
- A) ammonium ions
  - B) nitrite ions
  - C) nitrate ions
  - D) organic nitrogen
- 05) Various unit operations employed in a water treatment plant are:
- 1) Sand filtration
  - 2) Chemical coagulation
  - 3) Sedimentation
  - 4) Chlorination
  - 5) Flocculation.
- The correct sequence of these operations is:
- A) 2-5-3-1-4
  - B) 1-2-3-5-4
  - C) 2-1-5-3-4
  - D) 4-1-2-5-3
- 06) Which combination of surface water quality parameters will indicate adsorption and charge neutralization as the preferred mechanism of coagulation?
- A) High turbidity-low alkalinity
  - B) High turbidity-high alkalinity
  - C) Low turbidity-low alkalinity
  - D) Low turbidity-high alkalinity
- 07) The following list shows sewers of different types. Arrange them in an order of lowest to largest size.
- 1) Outfall sewer
  - 2) Main sewer
  - 3) House sewer
  - 4) Lateral
- A) 1,3,2,4
  - B) 3,4,2,1
  - C) 4,3,2,1
  - D) 1,2,4,3
- 08) For a haphazardly developed town, a suitable layout of water distribution system would be:
- A) Ring layout
  - B) Grid iron layout
  - C) Dead-end layout
  - D) Radial layout
- 09) The bacteria that are able to survive in the presence as well as the absence of free oxygen are called:
- A) Aerobic
  - B) Anaerobic
  - C) Facultative
  - D) Microaerophilic
- 10) When sufficient alkalinity is present in water and a sufficient quantity of alum is added, the gelatinous flocs of aluminium hydroxide are produced. Such a coagulation mechanism is called:
- A) Adsorption and charge neutralization
  - B) Sweep coagulation
  - C) Double layer compression
  - D) Interparticle bridging

- 11) UV radiation in sunlight is prevented from reaching the earth's surface by the presence of ozone in:
- Troposphere
  - Stratosphere
  - Thermosphere
  - Mesosphere
- 12) Air pollution may cause one of the following diseases to plants
- Typhoid
  - Pneumoconiosis
  - Necrosis
  - Tobaccosis
- 13) Following are some of the widely used units for the control of air pollution emissions from stacks. Which one of them offers the minimum pressure drop when used as a air pollution control unit?
- Wet scrubber
  - Electrostatic precipitator
  - Bag house
  - Cyclone
- 14) One of the following municipal solid waste disposal/treatment methods releases methane.
- incineration
  - landfilling
  - vermi-composting
  - sea disposal
- 15) Under the Plastics Waste Management Rules, use of which of the following items is banned with effect from 1st July 2022?
- 1) Plastic spoons
  - 2) Thermocol plates
  - 3) Plastic wrapping or packing sheets
  - 4) Ear buds with plastic sticks
  - 5) Plastic water bottles
- 1,2,3
  - 1,2,3,5
  - 1,2,3,4
  - 1,2,4,5
- 16) The force acting on a point on the surface of a rigid body may be considered to act
- At the centre of gravity of the body
  - On the periphery of the body
  - On any point in line of action of the force
  - At any point in the surface normal to the line of action of the force
- 17) A cantilever beam is
- statically determinate beam
  - unstable beam
  - Statically indeterminate to 1st degree
  - Statically indeterminate to 2nd degree
- 18) Net sectional area of a tension member is equal to its gross section area
- Plus the area of the rivet holes
  - Divided by the area of rivet holes
  - Multiplied by the area of the rivet holes
  - Minus the area of the rivet holes
- 19) The consistency index of a soil is defined as the ratio of
- Liquid limit plus the natural water content to the plasticity index of the soil
  - Liquid limit minus the natural water content to the plasticity index of the soil
  - Natural water content of a soil minus the plastic limit to the plasticity index of the soil
  - Natural water content of a soil plus the plastic limit to the plasticity index of the soil
- 20) A soil mass is said to be in plastic equilibrium if
- It is stressed to maximum
  - It is on the verge of failure
  - It is in plastic stage
  - It starts flowing
- 21) In geodetic surveys, higher accuracy is achieved if,
- Curvature of the Earth is ignored
  - Curvature of the Earth is taken into account
  - Angles between the curved lines are treated as plane angles
  - Angles between the curved lines are treated as included angles
- 22) Magnetic bearing of a survey line at any place
- Remains constant
  - Changes systematically
  - Varies differently in different months of the year
  - Is always greater than true bearing
- 23) Subtense tacheometry is generally preferred to if ground is
- Flat
  - Undulating
  - Mountainous
  - Desert
- 24) For accurate position fix, the three satellites
- Must be along a common arc
  - Must be in a vertical line above the receiver
  - Must be widely separated and well distributed
  - Must be such that one satellite is overhead of the receiver and other two widely separated

- 25) For the geometric design of the highway, the amount of camber to be provided depends upon the:
- Smoothness of the surface and intensity of rainfall
  - Speed of the expected travelling vehicles
  - Sight distance
  - Number of lanes
- 26) Which one of the following is not applicable according to the PIEV theory: Perception, Intellection, Emotion, Volition
- PIEV time depending on Physical and psychological factors of drivers
  - emotion is the time required for the sensation received by eyes or ears to be transmitted to the brain through nervous system
  - Intellection is the time required to understand the situation
  - Volition is time taken for final action
- 27) According to the IRC, in Highway design, intermediate sight distance is defined as:
- Twice the stopping site distance
  - 5.0 m
  - 3.2 m
  - Distance visible to the driver during night driving under the illumination of the vehicle head lights
- 28) The IRC has recommended the ruling gradient of
- 1 in 30 on plain, 1 in 20 in mountainous, and 1 in 16.7 in steep terrain
  - 1 in 16.7 in plain, 1 in 20 in mountainous and 1 in 30 in plain terrain
  - 1 in 20 in plain, 1 in 30 in mountainous and 1 in 16.7 in steep plain
  - 1 in 16.7 in plain, 1 in 30 in mountainous and 1 in 20 in steep terrain
- 29) Shoulders on the highway are the elements provided for:
- As an emergency lane for Vehicle compelled to be taken out of the roadway.
  - As a boundary between pavement and kerbs
  - Drive ways to provide connection of highway with commercial establishment
  - Preventing the entry of surface water into the subgrade pavement
- 30) The average number of vehicles per day passing on a section of the road during a particular year, is called
- Peak hour traffic
  - Average daily traffic
  - Design hourly volume
  - Development traffic
- 31) Highway Capacity is defined as the total number of vehicles
- That can be accommodated on a unit length road
  - That can pass a given point in a unit period of time
  - That can pass a given point in a specified period of time
  - That can be accommodated in a possible capacity
- 32) One of the disadvantages of traffic signals is :
- The rear-end collision may increase
  - It provides orderly movement of the traffic
  - Pedestrian can cross the road safely
  - Increase the traffic handling capacity
- 33) Plate bearing test is
- used to evaluate the supporting power of subgrade for use in pavement design
  - Evaluating the stability of the soil subgrade and other flexible pavement materials
  - An arbitrary strength test and cannot be used to evaluate the soil properties like cohesion or angle of internal friction
  - Penetration test developed by California division of Highways.
- 34) The flexible pavement distribute the wheel load
- Directly to subgrade
  - Through structural action
  - Through a set of layers to subgrade
  - through the wider area through slab action
- 35) Various types of joints provided in the cement concrete pavements to reduce temperature stresses have been:
- Expansion joints
  - Contraction joints
  - Warping joints
  - Overlap joint
- 1,2,3,4
  - 1,2,3
  - 1,3,4
  - 1 only
- 36) To reduce the wearing of rails, the rails are placed at an
- Inward slope of 1 in 20
  - Outward slope of 1 in 20
  - Inward slope of 1 in 30
  - Outward slope of 1 in 30

- 37) Which of the following factors are taken into account for estimating the runway length required for aircraft landing?
1. Normal maximum temperature
  2. Airport elevation
  3. Maximum landing weight
  4. Effective runway gradient
- Select the correct answer using the codes below:
- A) 1, 2, 3 and 4
  - B) 1, 3, and 4
  - C) 2 and 3
  - D) 1, 2 and 4
- 38) The capillary action in the water is due to
- A) Surface Tension
  - B) Viscosity
  - C) Compressibility
  - D) Gravity
- 39) The velocity distribution in laminar flow through circular pipe follows
- A) Logarithmic profile
  - B) Linear profile
  - C) Parabolic profile
  - D) Constant velocity profile
- 40) Ratio of inertia force to gravity force in flowing water is given by
- A) Froude Number
  - B) Reynold's Number
  - C) Mach Number
  - D) Webber Number
- 41) Which of the following factors does not contribute to total head loss in a pressurised flow?
- A) roughness of pipe
  - B) slope of pipe bottom
  - C) valves and bends in a pipe
  - D) velocity in pipe
- 42) SCS Curve number increases with
- A) Decrease in imperviousness
  - B) Dry antecedent moisture condition
  - C) Increase in infiltration rate
  - D) Increase in imperviousness
- 43) In Gumbel's distribution method of flood frequency analysis, the frequency factor (K) is function of
- A) Return Period only
  - B) Skew Coefficient only
  - C) Return Period and Sample Size
  - D) Return Period and Skew Coefficient
- 44) Construction of structures, like check dams, Nalla bunding, Gully plugging, percolation tanks, development of rainwater harvesting etc. are carried out to accomplish
- A) Watershed Management
  - B) Infrastructure Management
  - C) Crop Management
  - D) Soil Management
- 45) Which of the following components is provided on ogee or chute spillways to prevent cavitation?
- A) Divide wall
  - B) Baffle blocks
  - C) Anchor Bolts
  - D) Aeration Groove
- 46) The exit gradient of flow under impervious floor of barrage reduces with
- A) Increase in the depth of d/s sheet pile
  - B) Provision of gate
  - C) Decrease in floor length
  - D) Decrease in depth of u/s sheet pile
- 47) Steady state discharge in the tube well in confined aquifer increases with
- A) Increase in radius of influence
  - B) Decrease in effective radius of well
  - C) Increase in drawdown
  - D) Decrease in storage coefficient
- 48) Fluming in aqueduct is provided
- A) To reduce the cost of structure
  - B) To reduce the head loss
  - C) To reduce the velocity
  - D) To reduce the length of structure
- 49) The uplift force in gravity dam is reduced by
- A) Providing pressure relief valves
  - B) providing sheet pile
  - C) providing drainage holes and drainage gallery
  - D) providing grout curtain
- 50) Three coins are tossed at once. What is the probability of getting all 3 tails?
- A) 1/6
  - B) 1/8
  - C) 1/3
  - D) 3/8
- \*\*\*\*\*



**Rough Work:**