THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA, VADODARA

Ph. D. ENTRANCE TEST (PET) 2023

Signature of Invigilator

Roll. No.

Paper - II
Civil Engineering/WREMI

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: Ⓐ ● Ⓒ Ⓓ 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

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

01) The pH of a water sample was found to be 5.0. The concentration of hydroxide ions in this sample in mol/L will be:
A) 10^{-7}
B) 10^{-5}
C) 10^{-9}
D) 10^{-10}

02) The alkalinity and the hardness of a water sample are 200 mg/L and 300 mg/L as CaCO3, respectively. The water has
A) 300 mg/L carbonate hardness and zero non-carbonate hardness.
B) 200 mg/L carbonate hardness and zero non-carbonate hardness.
C) 200 mg/L carbonate hardness and 300 mg/L non-carbonate hardness.
D) 200 mg/L carbonate hardness and 100 mg/L non-carbonate hardness.

03) Various treatment units employed in a conventional sewage treatment plant are:

1. Grit chamber, 2. Screen, 3. Secondary sedimentation tank, 4. Primary sedimentation tank, 5. Aeration tank.

The correct sequence of these operations is:
A) 2-5-3-1-4
B) 1-2-3-5-4
C) 2-1-4-5-3
D) 4-1-2-5-3

04) For domestic wastewater sample, the ultimate BOD may be taken as ____% of the biodegradable COD (bCOD).
A) 48
B) 68
C) 92
D) 85

05) While analyzing a seawater sample for COD, the analyst forgot to add mercuric sulfate. What will be the result of this analysis?
A) The measured COD will be equal to actual COD
B) The measured COD will be lower than the actual COD
C) The measured COD will be more than the actual COD
D) Nothing can be said as mercuric sulfate is not an oxidizing agent

06) For a circular sedimentation tank of diameter D and the side water depth H, receiving a flow of water Q, the weir loading rate will be:
A) $4Q/\pi D^2H$
B) $Q/\pi DH$
C) $4Q/\pi D^2$
D) $Q/\pi D$

07) To prevent the erosion of sewer material, the velocity of flow in the sewer must be less than a certain value. This velocity is called:
A) Eroding velocity
B) Self-cleansing velocity
C) Limiting velocity
D) Self-suspension velocity

08) For a haphazardly developed town, a layout of water distribution system would be:
A) Ring layout
B) Grid iron layout
C) Dead-end layout
D) Radial layout

09) The presence of hardness in excess of permissible limit causes:
A) Cardio Vascular problems
B) Increased laundry expenses
C) Skin discolouration
D) Calcium and magnesium deficiency

10) A bag filter house is used for:
A) removal of plastic bags from sewage
B) accommodating sand filters for water treatment
C) removal of particulate matter from gaseous emissions
D) removal of gaseous pollutants from gaseous emissions

11) Particulates (< 1μm size) remaining suspended in air indefinitely and transported by wind currents are called:
A) aerosols
B) fumes
C) mists
D) Smoke

12) Out of the following four air pollutants normally found in urban environments, which one is the secondary air pollutant?
A) Sulfur dioxide
B) Nitrogen oxide
C) Hydrogen sulfide
D) Peroxyacetyle nitrate

13) At a place, two sources produce noise simultaneously. The total sound pressure level (measured in dB) cannot be obtained by summation of sound pressure levels from the two sources because:
A) the scale of sound pressure level (dB) is logarithmic
B) the dB values are in decimals
C) the noise is not a physical entity that can be calculated
D) the sound pressure levels can only be subtracted, not added

14) The population in a town in years 2000, 2010, and 2020 was found to be 50000, 60000, and 70000, respectively. What will be the population in year 2030 calculated by airthmatic increase method?
A) 90000
B) 80000
C) 76670
D) 75000

15) The amount of reinforcement for main bars in a slab is based upon
A) Minimum bending moment
B) Maximum bending moment
C) Maximum shear force
D) Minimum shear force

16) A propped cantilever beam is
A) statically determinate beam
B) unstable beam
C) Statically indeterminate to 1st degree
D) Statically indeterminate to 2nd degree

17) Effective length of a column effectively held in position and restrained in direction at one end but neither held in position nor restrained in direction at the other end is
A) 0.85 L
B) L
C) L
D) 2 L

18) Mild steel and wrought iron can be easily distinguished by
A) Nitric acid test
B) Hydrochloric acid test
C) Sulphuric acid test
D) Hydrofluoric Acid test

19) The angle of internal friction is maximum for
A) Angular-grained loose sand
B) Angular-grained dense sand
C) Round-grained dense sand
D) Round-grained loose sand

20) The maximum pressure which a soil can carry without shear failure is called
A) Safe bearing capacity
B) Net safe bearing capacity
C) Ultimate bearing capacity
D) Net ultimate bearing capacity

21) For slopes of limited extent, the surface of slippage is usually along
A) A parabolic arc
B) An elliptical arc
C) A straight line
D) A circular arc

22) The smaller horizontal angle between the true meridian and a survey line is known as
A) Declination
B) Dip
C) Azimuth
D) Bearing

23) The point on the photograph where bisector between the vertical line through optical centre of the camera lens and the plate perpendicular meets is known as
A) Principal point
B) Isocentre
C) Plumb point
D) Perspective centre

24) Which one of the following frequencies is used in GPS?
A) L1 with frequency 1575.42 MHz
B) L1 with frequency 1520 MHz
C) L1 with frequency 1227.6 MHz
D) L1 with frequency 1280.43 MHz

25) The zenith is the point on the celestial sphere
A) East of observer
B) West of observer
C) North of observer
D) South of observer

26) Which of the following requirement is given most importance in highway design?
A) Structural
B) Functional
C) Seasonal
D) Maintenance

27) In India, grade compensation for curvature is given at _____ % per degree of curve for metre gauge
A) 0.10
B) 0.03
C) 0.06
D) 0.07

28) The maximum value of superelevation, as prescribed by Indian Railways varies from ____ of gauge.
A) 1/2 to 1/4
B) 1/10 to 1/12
C) 1/3 to 1/4
D) 1/15 to 1/20

29) The radius of an exit taxiway is given by
A) $R = V^2 / 125f$
B) $R = V / 125f^2$
C) $R = V^{1/2} / 125f^3$
D) $R = V^2 / 125f^{1/2}$

30) _____ are provided near public conveniences with guide maps to enable drivers to stop clear off the carriageway.
A) Lay -byes
B) Driveways
C) Kerb
D) Footpath

31) A paved area for parking of aircrafts is known as:
A) Hanger
B) Parking
C) Apron
D) None of these

32) As per IRC, the recommended width of carriageway multi-lane pavements is ____ m.
A) 3.5
B) 7.0
C) 7.5
D) 3.75

33) _____ are those, which on the whole have low or negligible flexural strength.
A) Semi-rigid pavements
B) Composite pavements
C) Flexible pavements
D) Rigid pavements

34) The most important factor that is required for road geometrics is _____.
A) SSD
B) OSD
C) ISD
D) Speed of vehicle

35) Under normal loading, ____ pavement resists deformation and acts as a cantilever beam.
A) Flexible
B) Rigid
C) Both (a) and (b)
D) Neither (a) nor (b)

36) A part of pavement raised with respect to one side keeping the other side constant is called _____
A) Footpath
B) Kerb
C) Super elevation
D) Camber

37) The computation of the sight distance mainly depends upon
1. Driver's Reaction Tiime 2. Vehicle's Speed 3. Efficiency of Brakes 4. Gradient of Road
A) Only 1 & 2
B) Only 2 & 3
C) 1, 2, 3 & 4
D) None of the Above

38) For a broad-gauge railway track on a horizontal curve of radius R (in m), the equilibrium Cant e required for a train moving at a sped of V (in km per hour) is
A) $e = 1.676 V^2 / R$
B) $e = 1.315 V^2 / R$
C) $e = 0.80 V^2 / R$
D) $e = 0.60 V^2 / R$

39) The basic governing equation(s) for analysing steady flow through pipe system is/are
A) Continuity equation and energy equation
B) Specific energy equation
C) Momentum equation
D) Diffusion equation

40) The hydraulic jump in a stilling basin under constant discharge is classified as
A) Steady uniform flow
B) Steady gradually varied flow
C) Steady rapidly varied flow
D) Steady spatially varied flow

41) Which of the following instruments is used to measure the discharge in pipe with pressurised flow?
A) Current meter
B) Orifice meter
C) Pitot tube
D) V-notch

42) In uniform flow field, the fluid elements show
A) Rotation
B) Continuous linear deformation
C) Translation
D) Angular deformation

43) The ratio of pressure force to inertia force acting on fluid is
   A) Reynold Number
   B) Froude Number
   C) Weber Number
   D) Euler Number

44) As the percent of impervious land in urban catchment increases,
   A) Runoff decreases
   B) Runoff increases
   C) Runoff remain unchanged
   D) Infiltration increases

45) If 35 years annual maximum flood data are available, a flood with 100 year return period may be estimated using
   A) Webul formula
   B) Unit hydrograph
   C) SCS curve number method
   D) Gumbel distribution method

46) The computation of gradually varied flow in non-prismatic channel can be carried out using
   A) Standard step method
   B) Direct step method
   C) Rational method
   D) Normal distribution method

47) Which of the following methods can be used to estimate evapotranspiration?
   A) Modified Penman Monteith Method
   B) Horton Method
   C) SCS curve number method
   D) Lacey's theory

48) Steady state discharge of the tube-well constructed in the confined aquifer is not linearly proportional to
   A) Drawdown at well
   B) Hydraulic conductivity
   C) Effective radius of well
   D) Thickness of confined aquifer

49) The most appropriate spillway to perform the dual function of passing the flood and managing the sediment in the reservoir is
   A) Ogee spillway
   B) Side channel spillway
   C) Chute spillway
   D) Orifice spillway

50) As per Kennedy's theory, sediment in alluvial channel is kept in suspension by the vertical component of the eddies generated at all the points along the
   A) Wetted perimeter of channel
   B) Sides of channel
   C) Channel bed
   D) Toe portion of side slopes

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Rough Work: