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# GPSC

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## ESP-2 (PAPER-2)

### PROVISIONAL ANSWER KEY

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#### Note:-

- (1) All Suggestions are to be sent with reference to website published Question paper with Provisional Answer Key Only.
- (2) All Suggestions are to be sent in the given format only.
- (3) Candidate must ensure the above compliance.

- (૧) ઉમેદવારે વાંધા-સૂચનો રજૂ કરવા વેબસાઇટ પર પ્રસિધ્ધ થયેલ નિયત નમૂનાનો ઉપયોગ કરવો.
- (૨) ઉમેદવારોએ પોતાને પરીક્ષામાં મળેલ સીરીઝની પ્રશ્નપુસ્તિકામાં છપાયેલ પ્રશ્ન ક્રમાંક મુજબ વાંધા-સૂચનો રજૂ ન કરતા તમામ વાંધા-સૂચનો વેબસાઇટ પર પ્રસિધ્ધ થયેલ પ્રોવિઝનલ આન્સર કીના પ્રશ્ન ક્રમાંક મુજબ અને તે સંદર્ભમાં રજૂ કરવા
- (૩) ઉમેદવારોએ ઉક્ત સૂચનાનું અચૂક પાલન કરવું અન્યથા વાંધા-સૂચનો અંગે કરેલ રજૂઆતો ધ્યાને લેવાશે નહીં.



001. The true length of a line is known to be 200 m. When this is measured with a 20 m tape, the length is 200.80 m. The correct length of the 20 m tape is  
(A) 19.92 m (B) 19.98 m  
(C) 20.04 m (D) 20.08 m
002. The magnitude of the sag correction during measurement of length by chaining is proportional to the  
(A) Cube of the weight of the chain, in kg per m run  
(B) Cube root of the weight of the chain, in kg per m run  
(C) Square of the weight of the chain, in kg per m run  
(D) Square root of the weight of the chain, in kg per m run
003. A rectangular plot of  $16 \text{ km}^2$  in area is shown on a map by a similar rectangular area of  $1 \text{ cm}^2$ . The Representative Fraction of the scale to measured a distance of 40 km will be  
(A)  $1/1600$  (B)  $1/400000$   
(C)  $1/400$  (D)  $1/16000$
004. In reciprocal levelling, the error which is not completely eliminated, is due to  
(A) earth's curvature  
(B) non-adjustment of line of collimation  
(C) refraction  
(D) non-adjustment of the bubble tube.
005. Imaginary line passing through points having equal magnetic declination is termed as  
(A) isogonic line (B) agonic line  
(C) isoclinic line (D) aclinic line
006. To find the RL of a roof slab of a building, staff readings were taken from a particular set-up of the leveling instrument. The readings were 1.050 m with staff on the Bench Mark and 2.300 m with staff below the roof slab and held inverted. Taking the RL of the Bench Mark as 135.15 m, the RL of the roof slab will be  
(A) 136.400 m (B) 131.800 m  
(C) 133.900 m (D) 138.500 m

007. Consider the following:

- |                           |                         |
|---------------------------|-------------------------|
| (i) Line ranger           | (ii) Reciprocal Ranging |
| (iii) Random line ranging | (iv) Optical square     |

Which of these are employed to solve the problem of vision obstructed but chaining free?

- |                               |                         |
|-------------------------------|-------------------------|
| (A) (i), (ii), (iii) and (iv) | (B) (ii) and (iii) only |
| (C) (ii) and (iv) only        | (D) (iii) and (iv) only |

008. The arithmetic check for the computation of RL by 'Rise and Fall' method is given by

- (A)  $\Sigma FS - \Sigma BS = \text{RL of last station point} - \text{RL of first station point}$   
 $= \Sigma \text{Fall} - \Sigma \text{Rise}$
- (B)  $\Sigma BS - \Sigma FS = \text{RL of first station point} - \text{RL of last station point}$   
 $= \Sigma \text{Rise} - \Sigma \text{Fall}$
- (C)  $\Sigma BS - \Sigma FS = \text{RL of last station point} - \text{RL of first station point}$   
 $= \Sigma \text{Rise} - \Sigma \text{Fall}$
- (D)  $\Sigma BS - \Sigma FS = \text{RL of first station point} - \text{RL of last station point}$   
 $= \Sigma \text{Fall} - \Sigma \text{Rise}$

009. A level when set up 25 m from peg A and 50 m from peg B reads 2.847 m on staff held on A and 3.462 m on staff held on B, keeping bubble at its centre while reading. If the reduced levels of A and B are 283.665 m and 284.295 m respectively, what is the collimation error per 100.0 m

- |             |             |
|-------------|-------------|
| (A) 0.015 m | (B) 0.030 m |
| (C) 0.045 m | (D) 0.060 m |

010. The reduced bearing of a line is N 87°W. Its whole circle bearing is

- |         |          |
|---------|----------|
| (A) 93° | (B) 87°  |
| (C) 3°  | (D) 273° |

011. Measuring with a 30 m chain which is 0.01 m too short introduces a

- |                                 |                                 |
|---------------------------------|---------------------------------|
| (A) positive compensating error | (B) negative compensating error |
| (C) positive cumulative error   | (D) negative cumulative error   |

012. The sensitiveness of a bubble tube in a theodolite would decrease if  
(A) the viscosity of the liquid is increased  
(B) the radius of curvature of the internal surface of the tube is increased  
(C) the diameter of the tube is increased  
(D) the length of the vapour bubble is increased.
013. Which of the following is carried out by the two theodolite method?  
(A) Circular curve ranging (B) Tacheometric survey  
(C) Geodetic survey (D) Astronomical survey
014. The whole circle bearing of line AB and AC are  $20^{\circ}15'$  and  $337^{\circ}45'$  respectively. What is the value of the included angle BAC?  
(A)  $317^{\circ}30'$  (B)  $42^{\circ}30'$   
(C)  $358^{\circ}$  (D)  $177^{\circ}$
015. The intercept of a staff  
(A) is maximum if the staff is held truly normal to the line of sight.  
(B) is minimum if the staff is held truly normal to the line of sight  
(C) decreases if the staff is tilted away from normal  
(D) increases if the staff is tilted towards normal
016. A bearing of a line is also known as  
(A) reduced bearing (B) true bearing  
(C) magnetic bearing (D) azimuth
017. Keeping the instrument height as 1.5 m, height of staff 4 m, the slope of the ground as 1 in 10, the sight distance on the down-slope must be less than  
(A) 25 m (B) 30 m  
(C) 15 m (D) 20 m
018. A negative declination shows that the magnetic meridian is to the  
(A) eastern side of the true meridian  
(B) western side of the true meridian  
(C) southern side of the true meridian  
(D) northern side of the true meridian

019. The horizontal angle between the true meridian and magnetic meridian at a place is called.
- (A) azimuth (B) declination  
(C) local attraction (D) magnetic bearing

020. Match list I with list II and select the correct answer using the codes given below the lists:

List I	List II
(a) Adjustment of surveying instruments	(i) Bringing the various fixed parts of the instrument into proper relation with one another
(b) Bowditch Rule	(ii) Solution of 3-point problem
(c) Triangulation	(iii) measuring all the angles and the base line
(d) Bessel's method	(iv) Balancing the latitudes and departures
(A) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)	
(B) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)	
(C) (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)	
(D) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)	

021. A graph showing reflectance characteristics with respect to wavelength is called
- (A) Spectral reflectance curve (B) Spectral signature  
(C) Spectral Band (D) Spectral Emissivity curve

022. Which of the following methods of leveling eliminates the error due to curvature and refraction?
- (A) Fly levelling (B) Reciprocal levelling  
(C) Check levelling (D) Precise levelling

023. On a conformal projection
- (A) the shape of any small geographical area is preserved  
(B) equivalent map maintains true relationships of area, at a given scale, for every part as well as the whole  
(C) the scale is preserved in the direction perpendicular to the line of zero distortion  
(D) the scale is preserved in the direction radially outward from a point of zero distortion.

024. Remote sensing of the earth's surface is done by making use of the properties of which types of electromagnetic waves.
- (a) Emitted (b) Reflected  
(c) Diffracted (d) Absorbed  
(A) (a), (b), (c) and (d) (B) (a), (b) and (c)  
(C) (a) and (b) (D) (a) and (c)
025. The remotely sensed data has errors due to the following:
- (A) Imaging characteristics of the sensor  
(B) Stability and orbit characteristics of the platform  
(C) Motion of the earth  
(D) Atmospheric effects  
(A) (a), (b), (c) and (d) (B) (a), (c) and (d)  
(C) (a), (b) and (d) (D) (c) and (d)
026. When was the Water (Prevention and Control of Pollution) act enacted by the Indian Parliament.
- (A) 1970 (B) 1974  
(C) 1980 (D) 1985
027. The daily per capita consumption of water apparently increases with
- (a) Higher standard of living  
(b) Availability of sewerage in the city  
(c) Metered water supply  
(d) Wholesome and potable quality of water
- Which of these statements are correct?
- (A) (a), (b) and (c) (B) (b), (c) and (d)  
(C) (a), (c) and (d) (D) (a), (b) and (d)
028. If the total hardness and alkalinity of a sample of water are 300 mg/l and 100 mg/l (as  $\text{CaCO}_3$ ) respectively, then its carbonate and non-carbonate hardness will be respectively.
- (A) 100 mg/l and 200 mg/l (B) 400 mg/l and 300 mg/l  
(C) 100 mg/l and 400 mg/l (D) 400 mg/l and 0 mg/l

029. Electrical conductivity (EC) of water and total dissolved solids (TDS) are interrelated. The value of EC will
- (A) decrease with increase in TDS
  - (B) increase with increase in TDS**
  - (C) decrease initially and then increase with increase in TDS
  - (D) increase initially and then decrease with increase in TDS

030. Which one of the following would contain water with the maximum amount of turbidity

- (A) Lakes
- (B) Oceans
- (C) Rivers**
- (D) Wells

031. Match List-I (parameters) with List-II (Permissible concentrations in drinking water) and select the correct answer using the codes given below the lists:

- | List I        | List II        |
|---------------|----------------|
| (a) Hardness  | (i) 0.3 mg/l   |
| (b) Chlorides | (ii) 200 mg/l  |
| (c) Iron      | (iii) 250 mg/l |
| (d) Fluoride  | (iv) 0.1 mg/l  |
- (A) (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)**
  - (B) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
  - (C) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)
  - (D) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)

032. Match List-I (parameters) and List-II (diseases) and select the correct answer using the codes given below the lists:

- | List I                         | List II                |
|--------------------------------|------------------------|
| (a) Absence of fluorides       | (i) Methaemoglobinemia |
| (b) Excess of lead             | (ii) Goitre            |
| (c) Presence of excess nitrate | (iii) Dental caries    |
| (d) Absence of iodide          | (iv) Anaemia           |
- (A) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)**
  - (B) (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)
  - (C) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)
  - (D) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)

033. If the methyl orange alkalinity of water equals or exceeds total hardness, all of the hardness is  
(A) Non-carbonate hardness  
(B) Carbonate hardness  
(C) Pseudo hardness  
(D) Negative none-carbonate hardness
034. One Nephelometry Turbidity Unit is equal to the turbidity produced by  
(A) 1 mg of  $\text{SiO}_2$  dissolved in 1 litre of distilled water with the test being run according to absorption principle.  
(B) 1 mg of  $\text{SiO}_2$  dissolved in 1 litre of distilled water with the test being run according to scattering principle.  
(C) 1 mg of Formazin dissolved in 1 litre of distilled water with the test being run according to absorption principle.  
(D) 1 mg of Formazin dissolved in 1 litre of distilled water with the test being run according to scattering principle.
035. The cleaning of slow sand filter is done by  
(A) Reversing the direction of flow of water  
(B) Passing air through the filter  
(C) Passing a solution of alum and lime through the filter  
(D) Scrapping off top layer of sand admitting water
036. Uniformity coefficient of filter sand is given by  
(A)  $D_{50}/D_5$   
(B)  $D_{50}/D_{10}$   
(C)  $D_{30}/D_{10}$   
(D)  $D_{60}/D_{10}$
037. The various treatment processes in a water treatment plant are listed below:  
(a) Filtration  
(b) Chlorination  
(c) Sedimentation  
(d) Coagulation  
(e) Flocculation
- The correct sequence of processes in water treatment is  
(A) (d), (e), (c), (a), (b)  
(B) (c), (d), (e), (a), (b)  
(C) (d), (e), (c), (b), (a)  
(D) (d), (c), (e), (a), (b)

038. The purpose of a proportional weir at the effluent end of a channel type grit removal unit is to
- (A) provide easy passage of solid particles
  - (B) measure the rate of flow in the channel
  - (C) keep the depth of flow in the channel above a certain value
  - (D) maintain constant mean velocity in the channel**
039. A water supply scheme serves a population of 10,000 at the rate of 50 litres per capita per day. For chlorine dose of 2 ppm, the required amount of bleaching powder with 20% available chlorine will be
- (A) 0.5 kg
  - (B) 5 kg**
  - (C) 10 kg
  - (D) 15 kg
040. Which one of the following filters will produce water of high quality with respect to the bacteriological parameter.
- (A) Slow sand filter**
  - (B) Rapid sand filter
  - (C) Pressure filter
  - (D) Dual media filter
041. The purpose of providing a balancing reservoir in a water supply distribution system is to
- (A) equalize pressure in the distribution system
  - (B) store adequate quantity of water to meet requirements in case of break-down of inflow.
  - (C) store adequate fire fighting reserve
  - (D) take care of fluctuations in the rate of consumption.**
042. Which one of the following chemicals is employed for dechlorination of water?
- (A) Sodium sulphite**
  - (B) Sodium bicarbonate
  - (C) Calcium carbonate
  - (D) Hydrogen peroxide
043. Which one of the following can fix atmospheric nitrogen
- (A) Green algae
  - (B) Blue green algae**
  - (C) Red algae
  - (D) Brown algae

044. Which one of following test employs Ethylene Diamine Tetra Acetic Acid as a titrating agent?
- (A) Chlorides (B) Dissolved Oxygen  
(C) Hardness (D) Residual Chlorine
045. The slope of a 1.0 m diameter concrete sewer laid at a slope of 1 in 1000, develops a velocity of 1 m/s when flowing full. When it is flowing half-full, the velocity of flow through the sewer will be
- (A) 0.5 m/s (B) 1.0 m/s  
(C) 2.0 m/s (D) 4.0 m/s
046. Self-cleansing velocity is
- (A) The minimum velocity of flow required to maintain a certain amount of solids in the flow  
(B) The maximum velocity of flow required to maintain a certain amount of solids in the flow  
(C) Such flow velocity as would be sufficient to flush out any deposited solids in the sewer  
(D) Such flow velocity as would be sufficient to ensure that sewage does not remain in the sewer
047. The following data pertain to a sewage sample:
- (a) Initial DO = 10 mg/l  
(b) Final DO = 2 mg/l  
(c) Dilution Ratio = 1 : 100
- The BOD of the given sewage sample is
- (A) 8 mg/l (B) 10 mg/l  
(C) 100 mg/l (D) 800 mg/l
048. Sewage sickness occurs when
- (A) sewage contains pathogenic organisms  
(B) sewage enters the water supply system  
(C) sewage get clogged due to accumulation of solids  
(D) voids of soil get clogged due to continuous application of sewage on a piece of land.

049. The correct statement of comparison of ultimate BOD ( $BOD_u$ ), COD, Theoretical Oxygen Demand (ThOD) and 5-day BOD ( $BOD_5$ ) is
- (A)  $BOD_u > COD > ThOD > BOD_5$   
(B)  $COD > ThOD > BOD_u > BOD_5$   
(C)  $ThOD > COD > BOD_u > BOD_5$   
(D)  $COD > BOD_u > BOD_5 > ThOD$
050. A municipal sewage has  $BOD_5$  of 200 mg/l. It is proposed to treat it and dispose off into a marine environment. For what minimum efficiency should the sewage treatment plant should be designed?
- (A) 85% (B) 60%  
(C) 50% (D) 33.67%
051. What is 5 days  $20^\circ\text{C}$  BOD equal to?
- (A) 3 days at  $27^\circ\text{C}$  BOD (B) 4 days at  $30^\circ\text{C}$  BOD  
(C) 6 days at  $18^\circ\text{C}$  BOD (D) 7 days at  $32^\circ\text{C}$  BOD
052. Self purification of running streams may be due to
- (A) Sedimentation, oxidation and coagulation  
(B) Dilution, sedimentation and oxidation  
(C) Dilution, sedimentation and coagulation  
(D) Dilution, oxidation and coagulation
053. From ecological consideration, the minimum level of Dissolved Oxygen (DO) necessary in the rivers and streams is
- (A) 1 mg/l (B) 2 mg/l  
(C) 4 mg/l (D) 8 mg/l
054. When wastewater is disposed of into a running stream, four zones are formed. In which one of the following zones will the minimum level of dissolved oxygen be found?
- (A) Zone of degradation (B) Zone of active decomposition  
(C) Zone of recovery (D) Zone of clear water
055. The two main gases liberated from an anaerobic sludge digestion tank would include
- (A)  $\text{NH}_3$  and  $\text{CO}_2$  (B)  $\text{CO}_2$  and  $\text{CH}_4$   
(C)  $\text{CH}_4$  and  $\text{H}_2\text{S}$  (D)  $\text{NH}_3$  and  $\text{CH}_4$

056. Presence of nitrogen in a wastewater sample is due to the decomposition of  
(A) Carbohydrates (B) Proteins  
(C) Fats (D) Vitamins
057. When the recirculation ratio in a high rate trickling filter is unity then what is the value of the recirculation factor?  
(A) 1 (B)  $> 1$   
(C)  $< 1$  (D) 0
058. According the National Ambient Air Quality Standards (NAAQS), the permissible limit (daily average) for RSPM in Residential areas is  
(A)  $40 \mu\text{g}/\text{m}^3$  (B)  $60 \mu\text{g}/\text{m}^3$   
(C)  $100 \mu\text{g}/\text{m}^3$  (D)  $120 \mu\text{g}/\text{m}^3$
059. Aerodynamic diameter is the diameter of a sphere of unit density ( $1\text{g}/\text{cc}$ ) that has the same  
(A) terminal settling velocity  
(B) terminal viscosity  
(C) gravimetric effect  
(D) coefficient of thermal expansion
060. The effective height of the chimney is equal to  
(A) Height of the chimney + plume rise  
(B) Height of the chimney + plume rise + thermal rise  
(C) Height of the chimney + plume rise + pressure rise  
(D) Height of the chimney – plume rise
061. In a Gaussian Dispersion Model, the lateral dispersion coefficients are dependent on  
(A) Surface roughness  
(B) Atmospheric Stability  
(C) Downwind distance  
(D) Both Atmospheric stability and Downwind distance

062. Emission factor can be defined as:  
(A) the amount of substance released / intensity of a specific activity  
(B) the amount of substance released / second  
(C) the amount of substance released / gram of the fuel burnt  
(D) the total amount of substance released.
063. In a condition when Environmental Lapse Rate (ELR)  $\gg$  Dry Adiabatic Lapse Rate (DALR), which of the following plume behavior would be observed  
(A) Looping (B) Fanning  
(C) Conning (D) Lofting
064. Following are the 4 scenarios given relating the Environmental Lapse Rate (ELR) and Dry Adiabatic Lapse Rate (DALR). In which of the case, the mixing height would be the maximum.  
(A)  $ELR \gg DALR$  (B)  $ELR = DALR$   
(C)  $ELR \ll DALR$  (D)  $ELR = 0.75 * DALR$
065. Which one of the following pairs of pollutants is formed due to photochemical reactions.  
(A) CO and RSPM (B)  $O_3$  and PAN  
(C) PAN and  $NH_3$  (D)  $NH_3$  and CO
066. Which one of the following gases act as an asphyxiant?  
(A) CO (B)  $SO_2$   
(C)  $NO_2$  (D)  $Cl_2$
067. Which one of the following procedures is used for sampling of the flue gas in a chimney for Suspended Particulate Matter (SPM)  
(A) Isothermal sampling (B) Isokinetic sampling  
(C) Adiabatic sampling (D) Differential sampling
068. What will be the resultant decibel level when two sources make noise of equal decibels?  
(A) Decibel level will be the same  
(B) Decibel level will increase by 3 decibels  
(C) Decibel level will decrease by 3 decibels  
(D) Decibel level will be equal to the sum of decibels of the two sources

069. Which type of noise can be abated by providing lining on walls and ceiling with sound absorbing materials?  
(A) Reflection Noise (B) Refraction Noise  
(C) Source Noise (D) Structural Noise
070. A person can make a complainant to the competent authority if the noise levels exceeds the ambient noise levels by  
(A) 10 dB (B) 20 dB  
(C) 30 dB (D) 40 dB
071. If super elevation is not provided on a horizontal curve of a highway, then on which portion of the road are the pot holes likely to develop  
(A) Outer edge of the road (B) Inner edge of the road  
(C) Centre of the road (D) Shoulder of the road
072. Full amount of super elevation on a horizontal curve is provided at the  
(A) beginning of the transition curve  
(B) centre of the circular curve  
(C) end of the transition curve  
(D) centre of the transition curve
073. With all other relevant conditions remaining the same, the speed of a vehicle negotiating a curve is proportional to  
(Note:  $W$  = Weight of the vehicle)  
(A)  $W^{1/2}$  (B)  $W$   
(C)  $1/W$  (D)  $1/W^{1/2}$
074. An ideal horizontal transition curve is a  
(A) Parabola (B) Circle  
(C) Clothoid (D) Hyperbola
075. If  $R$  is the radius of the curve and  $L$  is the length of the long chord, the shift of the curve is (all in meter units)  
(A)  $L^2/R$  (B)  $L^2/2R$   
(C)  $L^2/24R$  (D)  $L^2/6R$

076. It is a common practice to design a highway to accommodate the traffic volume corresponding to the  
(A) 30th hour (B) Peak hour  
(C) Average daily traffic (D) 15 minute peak period
077. Which set of traffic studies is needed for functional design as well as for highway capacity design.  
(A) Origin and Destination studies  
(B) Parking and Accident studies  
(C) Speed and volume studies  
(D) Axle load studies
078. Speed and Delay study is conducted by which of the following method / instrument  
(A) Floating car method (B) Workspot interview method  
(C) Doppler Radar (D) Electronic Detector
079. Space mean speed is used for which of the following studies  
(A) Road conditions studies (B) Accident studies  
(C) Traffic flow studies (D) Delay studies
080. Traffic volume can be defined as  
(A) Number of vehicles occupying a unit length of road at a given instant of time  
(B) Number of vehicles at the cross roads.  
(C) Number of vehicles passing a given point on road in a given unit of time in a given direction.  
(D) Number of vehicles passing a given point on road in a given unit of time in all the possible directions.
081. Consider the following factors :  
(i) Reaction time  
(ii) Speed  
(iii) Coefficient of longitudinal friction  
(iv) Gradient.
- Which of these factors are taken into account for computing braking distance  
(A) (i) and (iv) (B) (i), (ii) and (iv)  
(C) (ii), (iii) and (iv) (D) (ii) and (iii)

082. Total reaction time of a driver depend upon:
- (i) Perception time
  - (ii) Brake reaction time
  - (iii) Speed of vehicle
- (A) (i) and (ii) (B) (i) and (iii)  
(C) (ii) and (iii) (D) (i), (ii) and (iii)
083. California bearing ratio is a
- (A) Measure of soil strength
  - (B) Method of soil identification
  - (C) Measure to indicate the relative strengths of paving materials
  - (D) Measure of shear strength under lateral confinement
084. The essential difference between rigid and flexible pavements is
- (A) Distribution of load over sub-grade
  - (B) Distribution of load over sub-base
  - (C) Materials used
  - (D) Thickness of layers
085. Rigid pavement are commonly made of
- (A) Bitumen
  - (B) Portland cement concrete
  - (C) Dry lean concrete
  - (D) High performance concrete
086. Which of the following pavement can be used, for construction on black cotton soils?
- (A) Flexible pavement
  - (B) Semi-flexible pavement
  - (C) Rigid pavement
  - (D) Semi-Rigid pavement
087. Which of the following layer of pavement should withstand high level of deformation?
- (A) Base course
  - (B) Sub-base
  - (C) Sub-grade
  - (D) Surfacing course
088. IRC 37-2001 revised version for flexible pavement design has been designed as
- (A) 4-layer
  - (B) 3-layer
  - (C) 2-layer
  - (D) 5-layer

089. Which one of the following expressions gives the Intermediate Sight Distance as per IRC standards
- (A)  $2 \text{ SSD}$  (B)  $(\text{SSD} + \text{OSD}) / 2$   
(C)  $(\text{OSD} - \text{SSD}) / 2$  (D)  $2 \text{ OSD}$
090. Which of the following pairs is NOT correctly matched
- (A) Horizontal curves - Super elevation  
(B) Origin and Destination studies - Desire Lines  
(C) Los Angeles Test - Hardness of aggregates  
(D) Soundness test - Purity of bitumen
091. The liquid limit and plastic limit of sample are 65% and 29% respectively. The percentage of the soil fraction with grain size finer than 0.002 mm is 24. The activity ratio of the soil sample is
- (A) 0.50 (B) 1.00  
(C) 1.50 (D) 2.00
092. The soil sample has a shrinkage limit of 10% and specific gravity of soil solids as 2.7. The porosity of the soil at shrinkage limit is
- (A) 21.2% (B) 27.0%  
(C) 73.0% (D) 78.8%
093. In a wet soil mass, air occupies  $1/6$  of its volume and water occupies  $1/3$  of its volume. The void ratio of the soil is
- (A) 0.25 (B) 0.50  
(C) 1.00 (D) 1.50
094. Lacustrine soils are soils
- (A) transported by rivers and streams  
(B) transported by glaciers  
(C) deposited in sea beds  
(D) deposited in lake beds
095. A soil sample is having a specific gravity of 2.60 and a void ratio of 0.78. The water content in percentage required to fully saturate the soil at that void ratio would be
- (A) 10 (B) 30  
(C) 50 (D) 70

096. A clay sample has a void ratio of 0.50 in dry state and specific gravity of solids is 2.70. Its shrinkage limit will be  
(A) 12% (B) 13.5%  
(C) 18.5% (D) 22.0%
097. A soil has liquid limit of 60%, plastic limit of 35% and shrinkage limit of 20% and it has a natural moisture content of 50%. The liquidity index of soil is  
(A) 1.5 (B) 1.25  
(C) 0.6 (D) 0.4
098. Consider the following statement in the context of Aeolian soils:  
(i) The soil has low density and low compressibility  
(ii) The soil is deposited by wind  
(iii) The soil has large permeability  
Which of these statements are correct?  
(A) (i), (ii) and (iii) (B) (ii) and (iii)  
(C) (i) and (iii) (D) (i) and (ii)
099. The collapsible soil is associated with  
(A) Dune sand (B) Laterite soil  
(C) Loess (D) Black cotton soil
100. Consistency as applied to cohesive soils is an indicator of its  
(A) Density (B) Moisture content  
(C) Shear strength (D) Porosity
101. In comparison to Atterberg limits of normal soil, the expansive soils which of the following:  
(i) More liquid limit (ii) Less plastic limit  
(iii) Less shrinkage limit (iv) More volumetric shrinkage  
Select the correct answers using the codes given below.:  
(A) (i), (ii), (iii) and (iv) (B) (i), (iii) and (iv)  
(C) (ii), (iii) and (iv) (D) (i), (ii) and (iv)

102. The correct sequence of plasticity of minerals in soil in an increasing order is  
(A) Silica, Kaolinite, Illite, Montmorillonite  
(B) Kaolinite, Illite, Montmorillonite, Silica  
(C) Montmorillonite, Silica, Kaolinite, Illite,  
(D) Kaolinite, Illite, Silica, Montmorillonite
103. Oedometer is used to calculate which of the following soil parameter  
(A) Compressibility (B) Permeability  
(C) Specific gravity (D) Particle size analysis
104. The total, neutral and effective vertical stresses (in  $\text{t/m}^2$ ) at a depth of 5 m below the surface of a fully saturated soil deposit with a saturated density of  $2 \text{ t/m}^3$  would respectively be  
(A) 5, 5 and 10 (B) 5, 10 and 5  
(C) 10, 5 and 10 (D) 10, 5 and 5
105. Consider the following statements:  
(i) Organic matter increases the permeability of a soil  
(ii) Entrapped air decreases the permeability of a soil  
Which of these statements is / are correct?  
(A) Only (i) (B) Only (ii)  
(C) Both (i) and (ii) (D) Neither (i) or (ii)
106. The coefficient of permeability does not depends upon  
(A) Void ratio of the soil  
(B) Duration of flow  
(C) Equivalent diameter of the soil grains  
(D) Shape of the particle
107. A soil has discharge velocity of  $5 \times 10^{-7} \text{ m/s}$  and a void ratio of 0.5. Its seepage velocity will be  
(A)  $15 \times 10^{-7} \text{ m/s}$  (B)  $10 \times 10^{-7} \text{ m/s}$   
(C)  $20 \times 10^{-7} \text{ m/s}$  (D)  $30 \times 10^{-7} \text{ m/s}$

108. A saturated clay layer with double drainage taken 5 years to attain 90% degree of consolidation under a structure. If the same layer were to be single drained, what would be time (in years) required to attain the same consolidation under the same loading conditions?
- (A) 10 (B) 15  
(C) 20 (D) 25
109. Riprap is provided to
- (A) protect river banks from erosion by river flow  
(B) increase the bearing capacity of the soil  
(C) accelerate the process of consolidation  
(D) reduce the pore pressure of the soil
110. The main function of a sand column to
- (A) prevent the escape of fine soils by seepage water  
(B) reduce damage due to liquefaction of saturated granular soils during earthquakes.  
(C) reduce seepage of water through the body of the earth dams.  
(D) facilitate the drainage of water through the body of the earth dams.
111. Consider the following statements:
- (i) A recovery ratio of less than 1 implies that the soil has compressed  
(ii) A recovery ratio greater than 1 implies that the soil has swelled  
(iii) A recovery ratio less than 1 implies that the soil has swelled  
(iv) A recovery ratio greater than 1 implies that the soil has compressed
- Which of these statements is/are correct?
- (A) (i) and (ii) (B) only (i)  
(C) (iii) and (iv) (D) only (iv)
112. Which one of the following equations correctly gives the relationship between the specific gravity of soil grains ( $G$ ) and the hydraulic gradient (i) to initiate 'quick' condition in a sand having a void ratio of 0.5?
- (A)  $G = 0.5i + 1$  (B)  $G = i + 0.5$   
(C)  $G = 1.5i + 1$  (D)  $G = 1.5i - 1$

113. A strata of 3.5m thick fine sand has a void ratio of 0.7 and  $G$  of 2.7. For a quick sand condition to develop in this strata, the water flowing in upward direction would require a head of  
(A) 7 m (B) 5.56 m  
(C) 5 m (D) 3.5 m
114. Consider the following statements:  
(i) Quicksand is a special variety of sand  
(ii) Quicksand is not a material but a hydraulic condition.  
(iii) In nature, quicksand condition is observed usually in coarse silt or fine sand.  
Which of the above statements are correct?  
(A) (i), (ii) and (iii) (B) (i) and (ii)  
(C) (ii) and (iii) (D) (i) and (iii)
115. In a compaction test if the compacting effort is increased, it will result in  
(A) Increase in maximum dry density and the Optimum Moisture Content  
(B) Increase in maximum dry density but Optimum Moisture Content remains same  
(C) Increase in maximum dry density and decrease Optimum Moisture Content  
(D) No change in maximum dry density and Optimum Moisture Content
116. Sheep foot rollers are used for  
(A) Compacting soil in confined areas and at corners  
(B) Compacting road and railway embankments of sandy soils  
(C) Densifying sandy soils over large area and to a larger depth  
(D) Compacting clayey soil fills
117. The following soils are compacted at the same compactive effort in the field. Which one of the following is the correct sequence in the increasing order of their maximum dry density?  
(A) Clay < Silty clay < Sand < Gravel sand clay mixture  
(B) Silty clay < Sand < Gravel Sand clay mixture < Clay  
(C) Sand < Gravel sand clay mixture < Clay < Silty Clay  
(D) Sand < Clay < Silty Clay < Gravel sand clay mixture

118. In the case of stratified soil layers, the best equation that can be adopted for computing the pressure distribution is  
(A) Prandtl's (B) Skempton's  
(C) Westergaard's (D) Boussinesq's
119. The change in the vertical stress in the soil mass estimated by Boussinesq's equation when Poisson's ratio of soil changes from 0.3 to 0.5 will be  
(A) reduction by 30% (B) increase by 50%  
(C) reduction by 20% (D) no change
120. In a Mohr's diagram, a point above Mohr's envelope indicates  
(A) an imaginary condition (B) a safe condition  
(C) an imminent failure condition (D) a condition of maximum obliquity
121. For assessing the long-term stability of a slope in stiff fissured clay which type of the following laboratory test has to be done.  
(A) Undrained triaxial test (B) Drained triaxial test  
(C) Consolidated undrained test (D) Quick vane shear test
122. A shear test was conducted on a soil sample. At failure, the ratio of  $(P_1 - P_3) / 2$  to  $(P_1 + P_3) / 2$  was equal to 1. Which one of the following shear test represents this condition?  
(A) Drained triaxial compression test  
(B) Undrained triaxial compression test  
(C) Undrained shear test  
(D) Unconfined compression test
123. Considerable loss of shear strength due to shock or disturbance is exhibited by  
(A) Under-consolidated clays (B) Normally consolidated clays  
(C) Over consolidated clays (D) Organic soil
124. The correct sequence of the given parameters in descending order of earth pressure intensity is  
(A) Active, Passive, At rest (B) Passive, Active, At rest  
(C) Passive, At rest, Active (D) At rest, Passive, Active

125. Terzaghi's consolidation theory is applicable to one-dimensional consolidation test  
(A) for small load increment ratios  
(B) for large load increment ratios  
(C) for a load increment ratio of nearly one  
(D) in situations where there is no excess pore pressure
126. To get the required shape of the tunnel section, we use  
(A) Cut holes (B) Trimmers  
(C) Easers (D) Chisels
127. Forepoling method is generally adopted for tunnelling in  
(A) Soft ground (B) Firm ground  
(C) Running ground (D) Rock Ground
128. Railway tunnels, are generally  
(A) polycentric (B) rectangular  
(C) parabolic (D) circular
129. The explosive used for tunneling in soft rocks is  
(A) Ammonia Dynamite (B) Special Gelatine  
(C) Blasting Gelatine (D) Semi Gelatine
130. For highways, tunneling is preferred to if the open cuts exceeds  
(A) 10 m (B) 15 m  
(C) 25 m (D) 50 m
131. Given that the base period is 100 days and the duty of the cannal is 1000 hectares per cumecs, the depth of water will be  
(A) 0.864 cm (B) 8.64 cm  
(C) 86.4 cm (D) 864 cm
132. Acidic soils are reclaimed by  
(A) Leaching of the soil  
(B) Using limestone as a soil amendment  
(C) Using gypsum as a soil amendment  
(D) Provision of drainage

133. The delta for a crop having base period 120 days is 70 cm. What is the duty?  
(A) 2480 hectare / cumec (B) 1481 hectare / cumec  
(C) 14.81 hectare / cumec (D) 1.481 hectare / cumec
134. What is the moisture depth available for evapotranspiration in root of 1 m depth soil, if dry weight of soil is 1.5 gm/cc, field capacity is 30% and permanent wilting point is 10%?  
(A) 450 mm (B) 300 mm  
(C) 200 mm (D) 150 mm
135. Which of these does not relate to the zone of aeration in the soil profile?  
(A) Saturation zone (B) Capillary zone  
(C) Intermediate zone (D) Soil water zone
136. The total number of independent equations that form the Lacey's regime theory are  
(A) 2 (B) 3  
(C) 4 (D) 5
137. Balanced depth of cutting of canal is  
(A) half the total depth of a canal  
(B) half of full supply depth  
(C) the maximum cut that an excavator can take  
(D) where volume of cutting is equal to volume of filling
138. The theory of Unit Hydrograph was propounded by  
(A) L. K. Sherman (B) A. N. Khosla  
(C) L. Prandtl (D) C. Inglis
139. Garret's diagram are used to  
(A) Separate base flow from total runoff  
(B) Correct inconsistency in rainfall data  
(C) Determine reservoir capacity  
(D) Design channels

140. The general depth of scour calculated by Lacey's formula in a river represents the depth below the  
(A) maximum flood level in the river  
(B) minimum flood level in the river  
(C) normal flow water level in the river  
(D) existing river bed level.
141. According to Kennedy, non-silting and non-scouring velocity is called  
(A) Optimal velocity  
(B) Critical velocity  
(C) Mean velocity  
(D) Average velocity
142. Hydraulic mean depth of a canal is the ratio between  
(A) Area of flow section and top water surface width  
(B) Area of flow section and the wetted perimeter  
(C) Total cross sectional area and top water surface width  
(D) Total cross sectional area and the wetted perimeter
143. Lacey's theory is applicable to flow  
(A) through pipes  
(B) over spillways  
(C) in alluvial rivers and canal  
(D) in concrete lined canals
144. Meandering of a river is due to  
(A) Sediment load of streams  
(B) Discharge and hydraulic properties of streams  
(C) Erodibility of the bed and banks of stream  
(D) The natural topography of the location
145. Isohyetal method is used for determination of  
(A) evapotranspiration  
(B) seepage loss  
(C) precipitation  
(D) intensity of flood
146. Hyetograph is a plot of  
(A) Cumulative rainfall v/s time  
(B) Rainfall intensity v/s time  
(C) Rainfall depth v/s time  
(D) Discharge v/s time

147. Probable maximum flood is  
(A) an impossibly large flood discharge  
(B) largest flood that could conceivably occur at a particular location  
(C) a flood with maximum probability of occurrence  
(D) the maximum possible flood which is probable for that year
148. Base flow separation is used in connection with  
(A) Seepage flow (B) Infiltration  
(C) Evaporation (D) Stream flow
149. Kor water is the  
(A) first watering before a crop is sown  
(B) first watering after a crop is sown  
(C) first water after a crop is grown  
(D) water of least depth
150. Permanent wilting point is  
(A) a characteristic of a plant  
(B) a soil characteristic  
(C) a soil characteristics modified by a plant  
(D) dependent on soil water plant fertilizer interaction
151. The cavitation and pitting can be prevented by creating which one of the following conditions?  
(A) Reducing the pressure head (B) Reducing the velocity head  
(C) Increasing the elevation head (D) Reducing the piezometric head
152. Maximum pressure rise due to water hammer in a pipeline is  
(Note : a = area of the pipe, V = Velocity, g = acceleration due to gravity, t = time period, length of the pipe line)  
(A)  $aV/2g$  (B)  $aV^2/2g$   
(C)  $LV/gt$  (D)  $LV^2/gt$
153. Choose the best option for the Newtonian fluid  
(A) Frictionless and incompressible  
(B) Viscosity is invariant with shear stress  
(C) Viscosity decreases at higher shear stress  
(D) Viscosity increases at higher shear stress

154. Which one of the following pressure units represent the least pressure  
(A) Millibar (B) Mm of Hg  
(C) N / mm<sup>2</sup> (D) Kgf / cm<sup>2</sup>
155. Consider the following parameters related to fluid flow:  
(i) Vorticity  
(ii) Velocity potential  
(iii) Stream Function  
Which of these parameters exist both in rotational and irrotational flows  
(A) i and ii (B) ii and iii  
(C) i and iii (D) i, ii and iii
156. Which of the following pair is incorrectly matched  
(A) Piezometric Head : Sum of datum head and pressure head  
(B) Dynamic Head : Sum of datum head and velocity head  
(C) Stagnation Head : Sum of pressure head and velocity head  
(D) Total Head : Sum of piezometric head and dynamic head
157. Hot wire anemometer is used for measuring which of the following parameter  
(A) Turbulence (B) Pressure  
(C) Mean velocity (D) Discharge
158. Lawn sprinkler can be best explained by which of the following equation of property?  
(A) Energy equation  
(B) Continuity equation  
(C) Moment of momentum principle  
(D) Impulse-momentum principle
159. The terminal velocity of a sphere settling in a viscous fluid varies as  
(A) the Reynolds number (B) the square of its diameter  
(C) Its diameter (D) viscosity of the fluid

160. Two identical pumps, each capable of delivering 0.2 cumec, against a head of 30 m, are connected in parallel. The resulting discharge will be  
(A) 0.4 cumec against a head of 30 m  
(B) 0.4 cumec against a head of 60 m  
(C) 0.2 cumec against a head of 30 m  
(D) 0.2 cumec against a head of 60 m
161. If the velocity of flow as well as the diameter of the flowing pipe are respectively doubled, the head loss thereafter be  
(A) Halved  
(B) Doubled  
(C) Increased 4 times  
(D) No change
162. Weber number can be best connected to which of the following  
(A) Formation of liquid droplet  
(B) High speed flow of a gas  
(C) Flow in closed conduits  
(D) Sloping interface between fluids of different densities
163. Euler number is related to  
(A) Inertia force and pressure force  
(B) Inertia force and elastic force  
(C) Inertia force and viscous force  
(D) Inertia force and gravity force
164. The gases are considered incompressible when Mach number is  
(A) equal to 1.0  
(B) equal to 0.5  
(C) more than 0.3  
(D) less than 0.2
165. Bernoulli's theorem deals with the law of conservation of  
(A) Mass  
(B) Momentum  
(C) Energy  
(D) None of the above
166. The flow in open channel is laminar if the Reynold number is  
(A) equal to 2000  
(B) between 500 – 2000  
(C) less than 500  
(D) more than 4000

167. Hydraulic Gradient Line represents the sum of  
(A) Pressure Head and kinetic Head  
(B) Kinetic Head and Elevation Head  
(C) Pressure Head, Kinetic Head and Elevation Head  
(D) Pressure Head and Elevation Head
168. Boundary layer thickness is the distance from the surface of the solid body in the direction perpendicular to flow where the velocity of fluid is equal to  
(A) Free stream velocity  
(B) 0.5 times the free stream velocity  
(C) 0.9 times the free stream velocity  
(D) 0.99 times the free stream velocity
169. The range of coefficient of discharge for a venturimeter is  
(A) 0.5 to 0.7  
(B) 0.7 to 0.8  
(C) 0.8 to 0.9  
(D) 0.95 to 0.99
170. Maximum discharge through a circular channel takes place when depth of flow is equal to  
(A) 0.95 times the diameter  
(B) 0.81 times the diameter  
(C) 0.5 times the diameter  
(D) 0.3 times the diameter
171. An aggregate is termed as flaky if  
(A) its least lateral dimension is less than 0.6 times its mean dimension.  
(B) its length is 1.8 times more than its mean dimension.  
(C) its least lateral dimension is less than 1.8 times its mean dimension.  
(D) its length is 0.6 times more than its mean dimension.
172. Maximum shear stress in a triangular section is  
(A) 1.33 times the average shear stress at  $y = h/3$   
(B) 1.5 times the average shear stress at  $y = h/3$   
(C) 1.33 times the average shear stress at  $y = h/2$   
(D) 1.5 times the average shear stress at  $y = h/2$

173. Total Kjeldahl Nitrogen is the  
(A) Summation of Organic and Ammonical Nitrogen  
(B) Summation of Organic and Albuminoid Nitrogen  
(C) Summation of Organic and Free Nitrogen  
(D) Difference of Organic and Ammonical Nitrogen
174. Heavy duty bricks used for bridges, foundation or industrial buildings, multi-story building, etc. have a compressive strength  
(A) less than  $25 \text{ N/mm}^2$   
(B) between  $25 \text{ N/mm}^2$  and  $30 \text{ N/mm}^2$   
(C) between  $30 \text{ N/mm}^2$  and  $40 \text{ N/mm}^2$   
(D) more than  $40 \text{ N/mm}^2$
175. Lime is mixed with brick earth to  
(A) impart plasticity  
(B) increase durability  
(C) prevent shrinkage  
(D) increase permeability
176. A good brick earth should contain Iron oxide in the range of  
(A) 5 – 7%  
(B) 12 – 15%  
(C) 15 – 20%  
(D) 20 – 25%
177. The soils which plot above the A-line in the plasticity chart are  
(A) Sands  
(B) Silts  
(C) Organic Soils  
(D) Clays
178. As per IS 456:2000, the permissible limit for sulphates in water to be used for making concrete is  
(A) 100 mg/lit  
(B) 200 mg/lit  
(C) 400 mg/lit  
(D) 500 mg/lit
179. If a simply supported beam is loaded with point load  $W$  at the centre then what is the ratio of bending moment at the support to the bending moment at the centre?  
(A) 0.5  
(B) 0  
(C) 1  
(D) 2

180. Deficiency of which of the following oxide causes reduction in setting time of cement  
(A) CaO (B)  $\text{Al}_2\text{O}_3$   
(C)  $\text{Fe}_2\text{O}_3$  (D) MgO
181. In limit state method of design, the value of permissible shear stress in concrete when shear reinforcement is not provided is  
(A)  $0.16(f_{ck})^{1/2}$  (B)  $0.25(f_{ck})^{1/2}$   
(C)  $0.34(f_{ck})^{1/2}$  (D)  $0.48(f_{ck})^{1/2}$
182. The under-reamed piles are connected by a reinforced beam known as  
(A) plinth beam (B) grade beam  
(C) plate beam (D) arch beams
183. A sand deposit has a porosity of 0.33 and its specific gravity is 2.5. The critical hydraulic gradient to cause sand boiling in the stratum will be  
(A) 2.0 (B) 1.5  
(C) 1.0 (D) 0.5
184. A cable subjected to its own weight and free of any other loads will take the form of  
(A) parabolic curve (B) elliptic curve  
(C) catenary curve (D) Bernoulli's Lemniscate
185. The area under the Beta distribution curve is divided into two equal parts by  
(A) most likely time (B) optimistic time  
(C) pessimistic time (D) expected time
186. Free float is mainly used to  
(A) Identify the activities which can be delayed without affecting the total float of the preceding activities  
(B) Identify the activities which can be delayed without affecting the total float of the succeeding activities  
(C) Identify the activities which can be delayed without affecting the total float of the preceding activities or succeeding activities  
(D) Establish priorities

187. Critical Path is always  
(A) the longest path (B) the shortest path  
(C) the most profitable path (D) the fastest path
188. Economic saving of time results by crashing  
(A) Cheapest critical activity (B) Cheapest non-critical activity  
(C) Costliest critical activity (D) Costliest non-critical activity
189. Interfering float is the difference between  
(A) Total float and Free float  
(B) Total float and Independent float  
(C) Independent float and Free Float  
(D) None of the above
190. The ability of a building material to withstand prolonged action of high temperature without melting or losing shape is  
(A) Thermal capacity (B) Refractoriness  
(C) Specific Heat (D) Fire Resistance
191. Intermediate vertical stiffeners are provided in plate girders to  
(A) eliminate web buckling (B) eliminate local buckling  
(C) prevent excessive deflection (D) to transfer concentrated loads
192. As per IS 456:2000, the maximum strain in concrete at the outer most compression fiber in limit state of design for a flexural member is taken as  
(A) 0.0065 (B) 0.0050  
(C) 0.0035 (D) 0.0020
193. The minimum grade of concrete for reinforced concrete construction in moderate exposure condition is  
(A) M20 (B) M25  
(C) M30 (D) M35
194. The thermal conversion technique where solid waste is treated with high temperature in absence of oxygen is called  
(A) Gasification (B) Vitrification  
(C) Pyrolysis (D) Incineration

195. Use of accelerators in concrete  
(A) Shortens the setting time (B) Shortens the curing time  
(C) Increases the setting time (D) Increases the curing time
196. Impact test is done to test which of the following properties  
(A) Ductility (B) Toughness  
(C) Endurance Limit (D) Resistance to abrasion
197. A single bay portal frame of height 'h' fixed at the base is subjected to a horizontal displacement  $\Delta$  at the top. The base moment developed is proportional to  
(A)  $1/h$  (B)  $1/h^2$   
(C)  $1/h^3$  (D)  $1/h^4$
198. Influence line Diagram for redundant structures can be obtained by  
(A) Castigliano's Theorem (B) Muller-Breslau Principle  
(C) Unit Load Theorem (D) All of the above
199. The number of simultaneous equations to be solved in the slope deflection method is equal to  
(A) the degree of statical indeterminacy  
(B) the degree of kinematic indeterminacy  
(C) the difference of the degree of statical indeterminacy and kinematic indeterminacy  
(D) the number of joints in the structure
200. According to IS 800, the maximum slenderness ratio of compression member carrying both dead load and live load is  
(A) 180 (B) 200  
(C) 250 (D) 350
201. A strut is a structural member subjected to  
(A) tension in a direction parallel to its longitudinal axis  
(B) tension in a direction perpendicular to its longitudinal axis  
(C) compression in a direction parallel to its longitudinal axis  
(D) compression in a direction perpendicular to its longitudinal axis

202. In plastic analysis, collapse load for a fixed uniform beam with central point load is  
(Note :  $M_p$  is plastic moment capacity and  $L$  is the span of the beam)  
(A)  $2M_p/L$  (B)  $4M_p/L$   
(C)  $8M_p/L$  (D)  $16M_p/L$
203. A reinforced concrete beam is subjected to 5 kNm bending moment due to dead load and 25 kNm bending moment due to live load. What should be the design bending moment for limit state of collapse?  
(A) 30.0 kN.m (B) 34.5 kN.m  
(C) 45.0 kN.m (D) 50.0 kN.m
204. Stability of the upstream slope of an earthen dam becomes critical for the condition of  
(A) Reservoir full (B) Reservoir empty  
(C) Sudden draw down (D) Slow filling of reservoir
205. Hydraulic jump occurs when flow changes from  
(A) Super-critical to sub-critical (B) Sub-critical to super-critical  
(C) Critical to turbulent (D) Laminar to turbulent
206. Eutrophication of lakes is caused by the discharge of water containing excessive quantities of  
(A) Nitrogen (B) Phosphorus  
(C) Potassium (D) Carbonaceous matter
207. Well oxidized sewage will contain sulphur largely in the form of  
(A) Sulphites (B) Sulphates  
(C) Hydrogen Sulphide (D) Carbon Sulphide
208. Which of the following coagulant is singularly effective in producing sludge for the activated sludge process  
(A) Alum (B) Chlorinated copperas  
(C) Ferric chloride (D) Ferric sulphate
209. The commonly used indicator for measuring iron concentration in water is  
(A) Erichrome Black T (B) Phenolphthalein  
(C) Methyl Orange (D) 1, 10 Phenanthroline

210. Fineness of cement is measured in the units of  
(A) Volume/Mass (B) Mass/Volume  
(C) Area/Mass (D) Mass/Area
211. Stainless steel resist corrosion due to presence of  
(A) Carbon (B) Manganese  
(C) Chromium (D) Sulphur
212. Linseed oil is used in paints as  
(A) Base (B) Vehicle  
(C) Drier (D) Accelerator
213. A circular shaft is subjected to a twisting moment  $T$  and bending moment  $M$ . The ratio of maximum bending stress to maximum shear stress is given by  
(A)  $2M/T$  (B)  $M/T$   
(C)  $2T/M$  (D)  $M/2T$
214. Pressure measured with the help of piezometer tube is  
(A) Atmospheric Pressure (B) Gauge Pressure  
(C) Absolute Pressure (D) Vacuum Pressure
215. Echo sounder is used to measure  
(A) Width of river (B) Velocity of river  
(C) Depth of river (D) Length of river
216. Bending moment at any section in a conjugate beam gives ..... in the actual beam.  
(A) Slope (B) Curvature  
(C) Deflection (D) Frictional resistance
217. Which of the following is a non-recording type of rain guage?  
(A) Symon's guage (B) Tipping-bucket type  
(C) Syphon type (D) Weighing bucket type
218. In limit state approach, the spacing of main reinforcement primarily controls  
(A) Collapse (B) Cracking  
(C) Deflection (D) Durability

219. A raft foundation of  $6 \text{ m} \times 9 \text{ m}$  is placed at a depth of  $3 \text{ m}$  in a cohesive soil having  $c = 120 \text{ kN/m}^2$ . The net ultimate bearing capacity of the soil using Terzaghi's theory will be.
- (A)  $820 \text{ kN/m}^2$  (B)  $1020 \text{ kN/m}^2$   
(C)  $1220 \text{ kN/m}^2$  (D)  $1420 \text{ kN/m}^2$
220. Sulphate attack over a building material is caused by salts of
- (A) Calcium (B) Magnesium  
(C) Sodium (D) Potassium
221. Porcelain is made by heating materials having
- (A) Kaolinite (B) Montmorillonite  
(C) Bentonite (D) Phyllite
222. Original plastic material without fibre reinforcement is called
- (A) Composite (B) Admixture  
(C) Binding agent (D) Virgin Plastic
223. Stress is
- (A) a measure of deformation of a material  
(B) resistance to forces resulting in elongation  
(C) internal force exerted by neighboring particles over each other  
(D) resistance to bending and torsion
224. Principal stresses are
- (A) Parallel to principal planes (B) Normal to principal planes  
(C) Parallel to each other (D) Opposite to each other
225. If Reynold's number is less than 1, then
- (A) Viscous forces are very strong as compared to inertial forces  
(B) Viscous forces are very weak as compared to inertial forces  
(C) Viscous forces are equal to inertial forces  
(D) Flow is turbulent in saturated soils
226. When the coefficient of rugosity is increased from 0.01 to 0.02, the gradient of a pipe of a given diameter to carry the same flow at the same velocity should be
- (A) increased by 4 times (B) increased by 2 times  
(C) decreased by 2 times (D) decreased by 4 times

227. Sonoscope is used for which of the following  
(A) Checking the accuracy of the water meter  
(B) Regulating the fire hydrants  
(C) Detecting of leakage in underground water mains  
(D) Checking the pressure in the water distribution network
228. Which of the following is the most important design parameter for a continuous flow rectangular sedimentation tank  
(A) Surface overflow rate  
(B) Length of the tank  
(C) Depth of the tank  
(D) Temperature of the water to be treated
229. Which of the following treatments is the most economically effective method for controlling Schistosomiasis  
(A) Filtration  
(B) Ozonation  
(C) Chlorination  
(D) UV radiation
230. Air binding in rapid sand filters is encountered when  
(A) the water is subjected to prolonged aeration  
(B) the water contains high dissolved gases  
(C) the filter bed comprises largely of coarse sand  
(D) there is excessive negative head
231. The purpose of recarbonation after lime-soda process of water softening is  
(A) Removal of excess soda from water  
(B) Removal of non-carbonate hardness  
(C) Conversion of precipitates to soluble form  
(D) Recovery of excess lime
232. As per IS1343-1980, the minimum characteristics strength pre-stressed concrete for post-tensioned and pre-tensioned work is  
(A) 25 MPa and 30 MPa respectively  
(B) 25 MPa and 35 MPa respectively  
(C) 30 MPa and 35 MPa respectively  
(D) 30 MPa and 40 MPa respectively

233. The permissible stress in axial tension in steel member on the net effective area of the section shall not exceed the following value  
(Note :  $f_y$  is the yield stress)  
(A)  $0.80 f_y$  (B)  $0.75 f_y$   
(C)  $0.60 f_y$  (D)  $0.50 f_y$
234. The partial factor of safety for concrete as per IS 456-2000 is  
(A) 1.50 (B) 1.15  
(C) 0.87 (D) 0.446
235. The dominating microorganisms in an activated sludge process reactor are  
(A) Aerobic heterotrophs (B) Anaerobic heterotrophs  
(C) Autotrophs (D) Phototrophs
236. The ideal C:N ratio during composting of waste is  
(A) 25 : 1 (B) 40 : 1  
(C) 10 : 1 (D) 8 : 1
237. The brick laid with its breadth parallel to the face of a wall is known as  
(A) Header (B) Stretcher  
(C) Closer (D) Queen Closer
238. In any good staircase, the maximum and minimum pitch respectively should be  
(A)  $90^\circ$  and  $0^\circ$  (B)  $75^\circ$  and  $5^\circ$   
(C)  $60^\circ$  and  $10^\circ$  (D)  $40^\circ$  and  $25^\circ$
239. Which of the following is not a carbonate mineral?  
(A) Dolomite (B) Calcite  
(C) Magnesite (D) Halite
240. Refractory cement is rich in  
(A) Calcium (B) Magnesium  
(C) Iron (D) Aluminum

241. The duty is the largest  
(A) At the head of the water course  
(B) At the head of the main canal  
(C) At the head of the distributary canal  
(D) At the field
242. What type of cross drainage work is provided when the canal runs below the river?  
(A) Aqueduct (B) Super passage  
(C) Level crossing (D) Siphon aqueduct
243. The relation between probability (P) and recurrence interval (T) is given by  
(A)  $PT = 1$  (B)  $PT^2 = 1$   
(C)  $P/T = 1$  (D)  $P/T^2 = 1$
244. Which of the equipment is used for controlling gaseous pollutants in air  
(A) Cyclone air separator (B) Bag house filter  
(C) Electrostatic precipitator (D) Wet scrubber
245. Charpy's V notch test is done on a building material to determine  
(A) Brittleness (B) Abrasion  
(C) Hardness (D) Elasticity
246. The size of aggregate, particle shape, colour, surface texture, all of which have influence on the durability of concrete should conform to  
(A) IS 383-1970 (B) IS 1489-1976  
(C) IS 12269-1987 (D) IS 456-2000
247. If sufficient moisture is always available to completely meet the needs of vegetation fully covering the area, the resulting evapotranspiration is called  
(A) Potential evapotranspiration (B) Actual evapotranspiration  
(C) Consumptive evapotranspiration (D) Direct evapotranspiration

248. In chemical Oxygen Demand test, the digested sample is titrated with standard Ferrous Ammonium Sulphate to determine the un reacted amount of  
(A) Mercuric sulphate (B) Potassium dichromate  
(C) Silver sulphate (D) Sulphuric acid
249. In plastic method of analysis, the value of yield stress of the grade of steel shall not exceed.  
(A) 250 MPa (B) 415 MPa  
(C) 450 MPa (D) 500 MPa
250. Which of following tests is conducted to assess shear strength parameter of the soil.  
(A) Hygrometer test (B) Compaction test  
(C) Triaxial test (D) Vane shear test
251. The species which if eliminated seriously affect the ecosystem are called as  
(A) Critical species (B) Keystone species  
(C) Niche species (D) Core species
252. Pug mill is used for  
(A) Clay preparation (B) Clay moulding  
(C) Brick drying (D) Brick burning
253. Fat lime is also called as  
(A) Quick lime (B) Hydraulic lime  
(C) Slaked lime (D) White lime
254. The bending moment on a section is maximum where shear force  
(A) is zero (B) is maximum  
(C) is minimum (D) changes sign
255. A body having similar properties throughout its volume is said to be  
(A) Homogenous (B) Isotropic  
(C) Continuous (D) Anisotropic

256. The moment of inertia of an area is always least with respect to  
(A) Vertical axis (B) Bottom most axis  
(C) Radius of gyration (D) Central axis
257. The hoop stress induced in a thick cylinder due to radial pressure will be  
(A) Tensile (B) Compressive  
(C) Shear (D) Bond
258. In a particular material, if the modulus of rigidity is equal to the bulk modulus, the Poisson Ratio would be  
(A)  $1/8$  (B)  $1/4$   
(C)  $1/2$  (D) 1
259. The tendency of a small drop of fallen water to remain in a spherical form is due to the property of  
(A) Viscosity (B) Adhesion  
(C) Surface tension (D) Gravimetric pull
260. Mercury is used in barometers because  
(A) it is a perfect liquid  
(B) its volume changes uniformly with temperature  
(C) it is a liquid metal  
(D) it gives less height of column for high pressure
261. The Euler's equation for steady flow of an ideal fluid along a stream line is based on Newton's  
(A) First law of motion (B) Second law of motion  
(C) Third law of momentum (D) Law of friction
262. In a venturimeter, the ratio between throat diameter and pipe diameter is generally adopted as  
(A) 1:2 (B) 1:4  
(C) 1:6 (D) 1:8

263. In a free vortex, velocity  
(A) decreases with radius  
(B) increases with radius  
(C) initially decreases then increases  
(D) remains constant
264. For laminar flow between parallel plates separated by a discharge of  $2h$ , head loss varies  
(A) directly as  $h$   
(B) inversely as  $h$   
(C) directly as  $h^2$   
(D) inversely as  $h^2$
265. Maximum surface run-off is because of  
(A) a flash storm  
(B) Leaf shaped catchment  
(C) Improved land management  
(D) Presence of forest area
266. A lysimeter is used to measure  
(A) Infiltration  
(B) Evaporation  
(C) Evapotranspiration  
(D) Radiation
267. The maximum size of clay particle is  
(A) 0.2 mm  
(B) 0.02 mm  
(C) 0.002 mm  
(D) 0.0002 mm
268. The porosity of a soil sample having its void ratio equal to unity would be  
(A) 33.33%  
(B) 50.00%  
(C) 66.66%  
(D) 75.00%
269. The shear strength of a soil in the plastic limit state is  
(A) Maximum  
(B) Zero  
(C) Equal to saturated soil strength  
(D) Very little
270. A Grillage foundation is essentially a  
(A) Shallow foundation  
(B) Deep foundation  
(C) Spread foundation  
(D) Pile foundation

271. The observe N value from a standard penetration test conducted on a saturated sandy soil is 30; the N-value corrected for dilatancy may be taken as  
(A) 15 (B) 20  
(C) 23 (D) 29
272. Gravity model is used in transportation planning process for  
(A) Modal split (B) Trip distribution  
(C) Trip generation (D) Trip assignment
273. The three moment equation in structural analysis is basically a  
(A) Stiffness method (B) Displacement method  
(C) Energy method (D) Flexibility method
274. The behavior of concrete under instantaneous load is  
(A) Elastic (B) Plastic  
(C) Anelastic (D) Visco-elastic
275. In limit state design of concrete structure, the strain distribution is assumed to be  
(A) Linear (B) Non-linear  
(C) Parabolic (D) Parabolic and Rectangular
276. The maximum deflection due to load in RCC beams in buildings is limited to  
(A) Span/100 (B) Span/250  
(C) Span/350 (D) Span/500
277. If the shape factor of a section is 1.5 and the factor of safety to be adopted in 2, then the load factor will be  
(A) 0.75 (B) 1.5  
(C) 2.5 (D) 3.0
278. The lighter sections of structural members subject to transverse loading are called as  
(A) Struts (B) Tie  
(C) Joists (D) Stancions

279. The following statement is true between Period (P) and frequency (F) of a sound wave
- (A) P is inversely proportional to f
  - (B) P is linearly proportional to f
  - (C) P is directly proportional to the square of f
  - (D) P is directly proportional to f
280. Choose the odd-one out from the following, in context with sinusoidal sound wave between sound pressure and time
- (A) Amplitude
  - (B) Wavelength
  - (C) Period
  - (D) Frequency
281. In a sinusoidal wave of the sound pressure, the number of times a peak amplitude arrives in one second is called as
- (A) Amplitude
  - (B) Wavelength
  - (C) Period
  - (D) None of these
282. The equivalent noise level is significant for the following:
- (A) Fluctuating noise over different time periods
  - (B) Fluctuating noise over constant time periods
  - (C) Constant noise over different time periods
  - (D) Constant noise over same time periods
283. Choose the odd-one out from the following noise pollution control means
- (A) Providing sound proof chambers/coatings for noisy sources
  - (B) Use of ear plugs
  - (C) Lubrication and maintenance of machinery
  - (D) Providing rubber / neoprene pads at the machine foundations
284. In a water distribution network, which of the following values will work automatically?
- (A) Check valve
  - (B) Butterfly valve
  - (C) Scour valve
  - (D) Sluice valve
285. The commonly used handpump is the
- (A) Centrifugal pump
  - (B) Reciprocating pump
  - (C) Rotary pump
  - (D) Axial flow pump

286. Which of the following is not the characteristic of coliform organism?  
(A) Bacillus (B) Gram-negative  
(C) Ferments lactose (D) Spore-forming
287. Tintometer is used for measuring which parameter in water?  
(A) Temperature (B) Colour  
(C) Turbidity (D) Volatile Solids
288. Which one of the following is the purpose of providing a surge tank in a pipeline carrying water?  
(A) To store water  
(B) To increase pressure throughout the pipeline  
(C) To store overflowing water  
(D) To protect the pipeline against water hammer
289. Which one of the following should be recommended for protected rural water supply project?  
(A) Pressure filter (B) Slow sand filter  
(C) Diatomaceous earth filter (D) Rapid sand filter
290. Orthotolidine test is done for assessing which of the following parameter?  
(A) Residual chlorine (B) Hardness  
(C) Chloride (D) Arsenic
291. In which treatment unit is Schmutzdecke formed?  
(A) Sedimentation tank (B) Rapid sand filter  
(C) Coagulation tank (D) Slow sand filter
292. What is predominant coagulating mechanism for raw water having high turbidity and high alkalinity  
(A) Ionic layer compression  
(B) adsorption and charge neutralization  
(C) sweep coagulation  
(D) Inter particle bridging

293. In a water treatment, the optimum time of flocculation is usually given as 30 minutes. In case the time of flocculation is increased beyond this value, the flocs will
- (A) become heavy and settle down in the flocculation tank itself
  - (B) entrap air and will float in the sedimentation tank**
  - (C) break up and defeat the purpose of flocculation
  - (D) stick to the paddles
294. EDTA titration method of hardness determination of water sample uses an indicator which combines with hardness causing divalent cations and forms a coloured complex. The name of the indicator and the colour of the formed complex respectively are
- (A) Ferroin and Dark blue
  - (B) Ferroin and Wine red
  - (C) Erichrome Black T and Dark blue
  - (D) Erichrome Black T and Wine red**
295. Which of the following material is used as land fill sealants for the control of gas and leachate movement?
- (A) Lime
  - (B) Sand
  - (C) Fly ash
  - (D) Bentonite**
296. Shallow ponds in which dissolved oxygen is present at all depth are called
- (A) Aerobic lagoons
  - (B) Aerobic ponds**
  - (C) Facultative lagoons
  - (D) Facultative ponds
297. For a sandy soil with soil grains in shape and uniform in size, what is the theoretical void ratio?
- (A) 0.61
  - (B) 0.71
  - (C) 0.81
  - (D) 0.91**

298. Two footings, one circular and the other square, are founded on the surface of purely cohesionless soil. The diameter of the circular footing is the same as that of the side of the square footing. The ratio of the ultimate bearing capacities of the circular footing to the square footing will be
- (A) 1.0 (B) 1.3  
(C) 1.33 (D) 0.75
299. The load carrying capacity of an individual friction pile is 200 kN. What is the total load carrying capacity of a group of 9 such piles with a group efficiency factor of 0.8?
- (A) 1800 kN (B) 1640 kN  
(C) 1440 kN (D) 900 kN
300. The main reason of the sick building syndrome focusing the Indoor Air Quality in buildings is
- (A) Inadequate ventilation  
(B) Contamination from inside the buildings  
(C) Contamination from outside buildings  
(D) Microbial contamination