MOCK – 2
GATE-2015 (CIVIL ENGINEERING)

- This Mock Test Paper consists of 65 questions carrying 100 marks.

- Kindly attempt this paper in 3 hours.

- Questions Q.1 – Q.25 carry 1 mark each. Questions Q.26 – Q.55 carry 2 marks each.

- Questions Q.56 – Q.65 belong to General Aptitude (GA) section and carry a total of 15 marks. Questions Q.56 – Q.60 carry 1 mark each, and questions Q.61 – Q.65 carry 2 marks each.

- Unattempted questions will result in zero mark and wrong answers will result in **NEGATIVE** marks. For all 1 mark questions, 1/3 mark will be deducted for each wrong answer. For all 2 marks questions, 2/3 mark will be deducted for each wrong answer.

- Answers and Solutions of the test have been provided in separate documents which can also be downloaded from www.egyanbodh.wix.com/gyanbodh.

- All efforts have been made to make this information as accurate as possible; www.egyanbodh.wix.com/gyanbodh or its author will not be responsible for any loss to any person caused by inaccuracy in the information available in this Mock Test.

- Relevant/Authentic Text Books may be consulted for further information.

- Any discrepancy found may be brought to our notice by sending a mail to egyanbodh@gmail.com.

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1. If A & B are square matrices of nxn order, which one of the following is correct

   1) AB = BA

   2) $(A^T B)^T = AB^T$

   a) Only 1

b) Only 2

c) Both 1 & 2

d) None

2. Let V be the velocity vector of a steady fluid flow. The condition for irrotational flow is

a) Curl V = 0

b) Div V = 0

c) Grad V = 0

d) All

3. As per IS 800:2007, the maximum effective slenderness ratio for compression flange of a beam against lateral torsional buckling is

a) 180

b) 250

c) 300

d) 350

4. Consider the given fig. of a plane element.
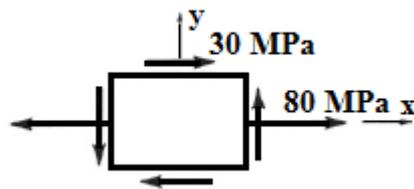
The maximum shear force on the plane element is

a) 30 MPa

b) 40 MPa

c) 50 MPa

d) Can not be determined

5. The hydraulic head at a point in the soil includes

    1) Datum head

    2 Piezometric head

    a) Only 1

    b) Only 2

    c) Both 1 & 2

    d) None

6. Precipitation caused by lifting of an air mass due to the pressure difference is called

    a) Cyclonic precipitation

    b) Orographic precipitation

    c) Convectional precipitation

    d) Frontal precipitation

7. If a descending gradient of 1 in 50 meets another descending gradient of 1 in 30 then the deviation angle is

    a) 1/50

    b) 1/75

    c) 1/30

    d) 8/150

8. Tensiometer is used to measure

    a) Capillary potential

    b) Permeability

    c) Vapour pressure

    d) Evapotranspiration

9. In a field measuring 30 hectares, 40 cm of water was stored in the root zone when 6 cumecs of water was supplied for 7 hours 30 minutes. The approximate field application efficiency is

   a) 50%

   b) 65%

   c) 75%

   d) 85%

10. If A = $\begin{bmatrix} a & 0 \\ 1 & 1 \end{bmatrix}$ and B = $\begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}$, then the value of 'a' for which $A^2 = B$, is

    a) 1

    b) -1

    c) 0

    d) 4

11. As per IS 1498-1970, silts and clays can be divided into 3 categories based on liquid limit: Low compressibility, high compressibility and high compressibility. Silts and clays of low compressibility have a liquid limit less than

    a) 20

    b) 25

    c) 30

    d) 35

12. In case of laminar flow, if the diameter of the pipe gets doubled, the flow rate for the same head loss will become

    a) 2 times

    b) 16 times

    c) 4 times

d) 1/2 times

13. The probability of A winning against B is 1/2. Assuming the independence from game to game the probability that in a 5 game series A's second win occurs at third game is

a) 1/8

b) 1/4

c) 1/2

d) 2/3

14. Which of the following statements are correct:

1) The silt soil has particle size from 0.002 mm to 0.075 mm

2) Inorganic fine grained silt soil possesses no plasticity

a) Only 1

b) Only 2

c) Both 1 & 2

d) None

15. Both elastic and plastic methods of analysis of indeterminate structures have to satisfy?

a) Equilibrium

b) Compatibility of deformation

c) Both a & b

d) None

16. A fillet welded joint between two plates is shown as below:
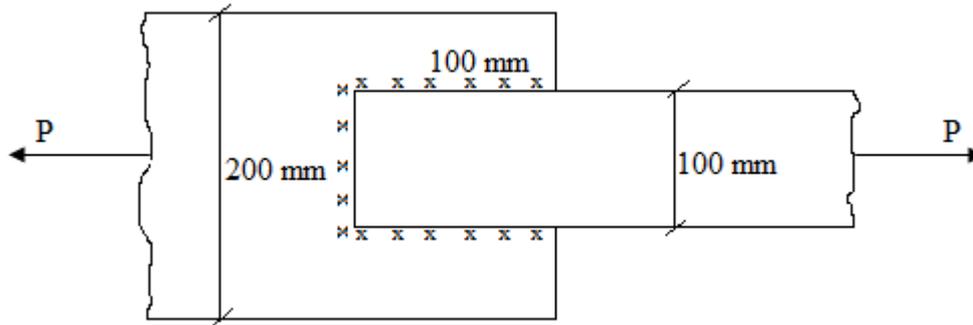
If the permissible shear stress in fillet weld is 108 MPa, then the safe load P that can be carried by joint is_____. (Size of weld = 8 mm)

a) 60.48 kN

b) 120.96 kN

c) 181.44 kN

d) 259.20 kN

17. For the same discharge, the ratio of the slopes for a sewer pipe flowing half to that for the same pipe flowing full would be:

a) 1

b) 2

c) 4

d) None of these

18. A beam subjected to a load P is shown below. The BM at the support A of the beam will be
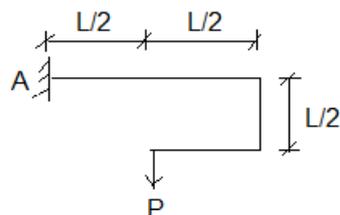
(a) PL

(b) PL/2

(c) 2PL

(d) zero

19. The solution of the differential equation $dy/dx + y = e^{-x}$ with boundary condition: $y = 0$ when $x = 0$ is

   a) $x\,e^{-x}$

   b) $x\,e^{x}$

   c) e^{-x}/x

   d) Log x

20. If 'p' is total internal pressure, 'd' is diameter of pressure conduit and 't' is thickness of conduit, the Hoop's stress is

   a) $\pi dp/t$

   b) $\pi dp/2t$

   c) $dp/2t$

   d) $dp/\pi t$

21. The compound responsible for early strength of concrete is

   a) C_3S

   b) C_2S

   c) C_3A

   d) C_4AF

22. Which of the following is/are correct

    a) Contours of different elevation may cross each other in the case of an over hanging cliff

    b) The angle of intersection of a contour and a ridge line is 90°

    c) Both a and b

    d) None

23. If the coefficient of friction on the road surface is 0.15 and a maximum super elevation 1 in 15 is provided, the maximum speed of the vehicles on a curve of 100 metre radius is

    a) 32.44 km/hr

    b) 42.44 km/hr

    c) 52.44 km/hr

    d) 62.44 km/hr

24. Imhoff cone is used to determine

    a) Settlable solids

    b) suspended solids

    c) dissolved solids

    d) None of these

25. For the fig. given below, the stress at the base CC is
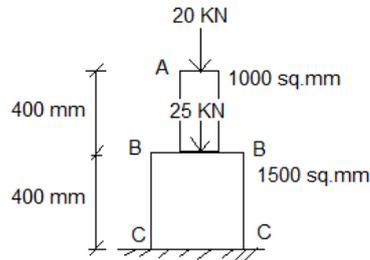
a) 13.33 N/mm^2

b) 16.67 N/mm^2

c) 30 N/mm^2

d) None of these

26. The rank of the matrix given is

$$\begin{bmatrix} 1 & -2 & 3 & -4 \\ 2 & -3 & 4 & -1 \\ 3 & -4 & 1 & -2 \\ 4 & -1 & 2 & -3 \end{bmatrix}$$

a) 1

b) 2

c) 3

d) 4

27. Considering sufficient differentiability, which of the following is correct

1) div (curl v) = 0

2) curl (grad f) = 0

Where f is a scalar function and v is a vector function.

a) Only 1

b) Only 2

c) Both 1 & 2

d) None

28. The mean and the variance of a binomial distribution are 4 and 2 respectively. The probability of 2 successes is

a) 28/256

b) 219/256

c) 128/256

d) 37/256

29. A right circular cone with radius R and height H contains a liquid which evaporates at a rate proportional to its surface area in contact with air (proportionality constant = k > 0). The time required for emptying the tank depends upon

a) Height H and Radius R only

b) Radius R and proportionality constant k only

c) Height H and proportionality constant k only

d) Height H, Radius R and proportionality constant k

30. The value of 'a' for which the sum of the squares of the roots of the equation x^2 – (a-2)x – a – 1 = 0 assume the least value is

a) 1

b) 0

c) 3

d) 2

31. Match the following and select correct answer using codes given below:

   A. Bernard   1. Relation between maximum flood discharge, flood frequency
                           And catchment

   B. Fuller's formula 2. Flood frequency by channel percent

   C. Hazen   3. $Q = CA^{0.75}$

   D. Dicken's formula 4. Concept of distribution graph

	A	B	C	D
a)	4	2	3	1
b)	1	2	3	4
c)	4	1	2	3
d)	3	1	4	2

32. The horizontal reaction at the support A of the structure shown below is
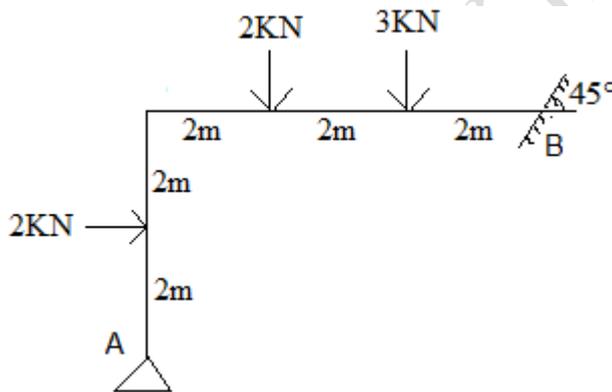
a) zero

b) 0.5 KN

c) 1 KN

d) 2 KN

33. A rectangular concrete beam 120 mm wide and 300 mm deep is prestressed concentrically by a cable carrying a force of 180 kN. If a uniformly distributed load of 4 kN/m (which includes self weight) is imposed over a simply supported span of 6m, then the ordinate of the pressure line from neutral axis at mid span is

   a) 50 mm

   b) 66.67 mm

   c) 100 mm

   d) 125 mm

34. Which of the following is/are true:

   1) In a section, shear centre is a point through which, if the resultant load passes, the section will not be subjected to any bending.

   2) Principle involved in the relationship between submerged unit weight and saturated weight of a soil is based on stokes' law.

   a) Only 1

   b) Only 2

   c) Both 1 & 2

   d) None

35. The moment (negative) at support A of the given frame is
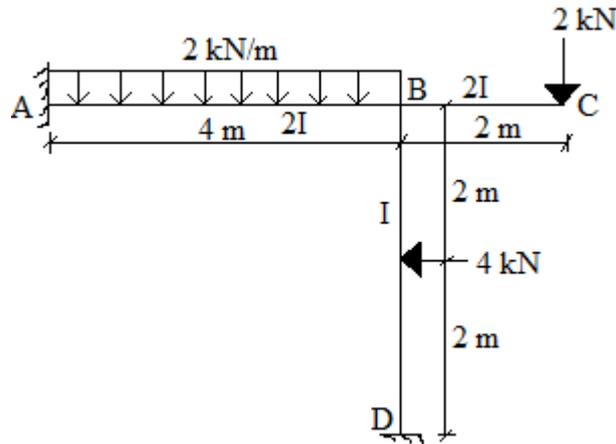
a) 0.89 kNm

b) 1.56 kNm

c) 2.48 kNm

d) 4.73 kNm

36. A wide-channel flow at depth 60 cm passes through a hydraulic jump and emerges at a depth of 3.0 m. The critical depth of flow is
    a) 1.25 m
    b) 1.5 m
    c) 1.6 m
    d) 1.75 m

37. A temporary diversion has been constructed on a highway of +4% gradient due to major repairs that are being undertaken on a bridge. The maximum speed allowed on the diversion is 10 km/h. The minimum distance (approx.) from the diversion that a road sign should be located informing drivers of the temporary change on the highway is _____. Maximum allowable speed on highway = 70 km/h

    Letter height of road sign = 10 cm

    Perception-reaction time = 2.5 sec; f = 0.33

Assume that a driver can read a road sign within his or her area of vision at a distance of 2 m for each cm of letter height.

a) 80 m

b) 100 m

c) 120 m

d) 140 m

38. A channel has a bottom width of 200 m, depth 6 m and side slopes 1:1. If the depth is increased to 9 m by dredging, the percentage increase in velocity of flow (full) in the channel upto 2 decimal places is _____ (Use chezy's formula)

39. A column section consisting of ISHB 300 @ 63 kg/m with cover plate of 400 mm width and 20 mm thickness connected to each flange carries an axial load of 3000 kN all inclusive.
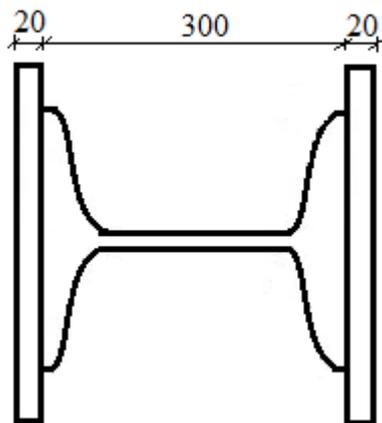
A simple base plate of size 90 cm x 90 cm is used to support the column. If the allowable bending stress in base plate is 185 MPa, the minimum thickness of the base plate as per IS 800:2007 is

a) 6 cm

b) 7 cm

c) 8 cm

d) 9 cm

40. The maximum rise (Y) of a jet from an inclined plate as shown in fig. (not to scale) is
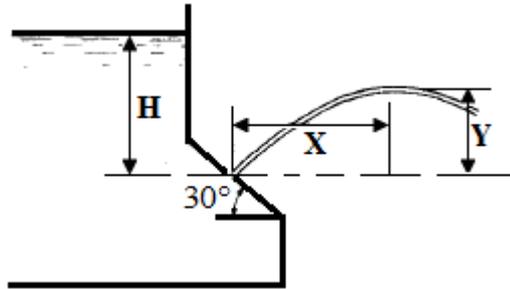
    a) H/8

    b) H/4

    c) H/2

    d) 3H/4

41. Figure below shows vehicles traveling at constant speeds on a two-lane highway between sections X and Y with their positions and speeds obtained at an instant of time by photography.
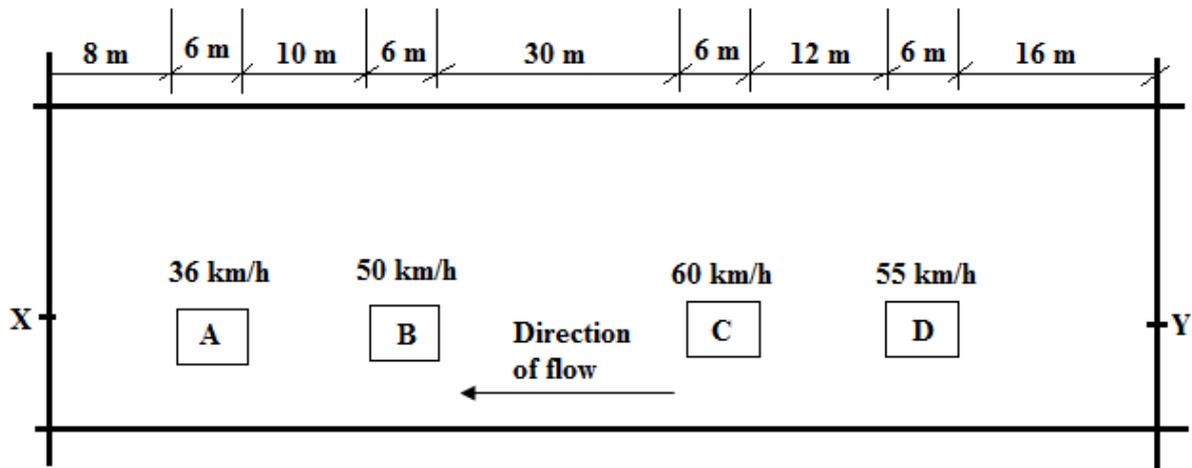
The velocities of the vehicles are measured as 36, 50, 60, and 55 km/h respectively. The time mean speed for the system is

    a) 50.25 km/h

    b) 48.46 km/h

    c) 46.52 km/h

    d) 36.84 km/h

42. Consider the follwing statements:

1) Biochemical Oxygen Demand (BOD) of waste water is a measure of total concentration of organic matter

2) A septic tank is an aerobic method of on site sewage treatment

Which of the above statements is correct

a) Only 1

b) Only 2

c) Both 1 & 2

d) None

43. A punch of diameter 20 mm is used to punch a hole in 8mm thick steel plate as shown in fig. If a force of 110 kN is required to create the hole, then
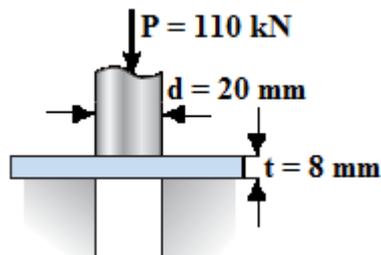
1) The average shear stress in the plate is equal to the average compressive stress in the punch.
2) The value of avg. compressive stress in the punch is 350 Mpa.
Which of the above is correct
a) Only 1
b) Only 2
c) Both 1 & 2
d) None

44. A 1: 6 scale model automobile is tested in a wind tunnel in the same air properties as the prototype. The prototype velocity is 48 km/h. If for dynamically similar conditions, the model drag is 320 N, then the drag of the prototype automobile is

a) 260 N

b) 320 N

c) 400 N

d) 460 N

45. Two platoons of cars are timed over a distance of 0.5km. Their flows are recorded. The first group is timed at 40 seconds, with the flow at 1350 vehicles per hour. The second group take 45 seconds, with a flow of 1800 vehicles per hour. If there is a linear relationship between speed and density, then the maximum flow of the traffic stream in veh/hour is _____.

46. The below fig. shows a concrete settling tank of thickness 0.30 m with top at an elevation of 100.00 m.
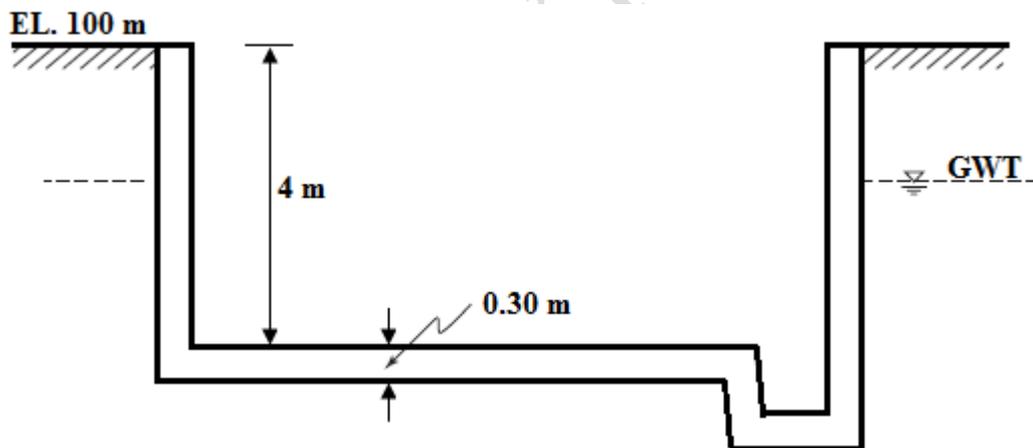
The elevation of the groundwater table that will cause the tank to float is _____.
Assume density of concrete = 24 kN/m^3 and γ_w = 10 kN/m^3

a) 95.70 m

b) 95.85 m

c) 96.42 m

d) 97.85 m

47. A square footing of size 2m x 2m is to be constructed at a depth of 4 m below ground level on a sandy clay for which the cohesion C is 0.62 kg/cm^2 and the density is 1.75 g/cc. If the total load applied on the soil is 160 tonnes uniformly distributed over the area of contact, the factor of safety is _____. (Use Terzaghi's formula; N_c = 10, N_q = 4, N_γ = 2)

a) 2

b) 2.5

c) 3

d) 3.5

48. The time of reach 40% consolidation on a two way drained laboratory 1 cm thick saturated clayey soil sample is 35 seconds. The approximate time required for 80% consolidation of the same soil 10 m thick on the top of a rocky surface subjected to the same loading conditions as the laboratory sample is

a) 10 years

b) 15 years

c) 18 years

d) 20 years

49. A regime channel is having a discharge of 50 cumecs and an average grain size of 0.39 mm. The hydraulic mean depth for the channel using Lacey's theory is _____

a) 1.30 m

b) 1.72 m

c) 3.56 m

d) 6.14 m

50. A rectangular beam with b = 350 mm and d = 550 mm has a factored shear of 400 kN at a section near the support. The steel at the tension side of the section consists of four 32 mm diameter bars which are continued to support. Assume M25 concrete and Fe 415 steel. If 10 mm, 2 legged vertical stirrups are used for carrying factored shear, then the maximum spacing of stirrups that can be provided is _____. (τ_c = 0.76 N/mm^2 and τ_{cmax} = 3.1 N/mm^2)

    a) 90 mm

    b) 120 mm

    c) 150 mm

    d) 230 mm

51. The tensile stress imposed by a semicircular wheel load of 0.4 metric tonne imposed during the day and located at the edge of a concrete pavement of thickness 15 cm in kg/cm^2 is _____(upto 2 decimal places).
    Characteristic strength of concrete = 250 kg/cm^2, g = 10 m/s^2, Poisson's ratio of concrete, μ = 0.15, modulus of subgrade reaction, K = 6.0 kg/cm^3, radius of loaded area = 7.5 cm. Use Westergaard's equation.

52. It is required to supply water to a population of 1,00,000 at a per capita demand of 150 litres per day. The disinfectant used for chlorination is bleaching powder which contains 30% of available chlorine. The residual after 10 minutes contact is 0.2 mg/L. If the amount of bleaching powder required daily is 30 kg, the chlorine demand of the water is

    a) 0.1 mg/L

    b) 0.2 mg/L

    c) 0.3 mg/L

    d) 0.4 mg/L

53. A page of level book is shown below with some missing entries marked as cross(x).

Station	B.S.	I.S.	F.S.	Rise	Fall	RL	Remarks
1	3.850						
2	2.320		X		0.500		Change point
3		2.850			X		
4	X		2.250	X			Change point
5			2.930		0.020	100.00	

If the RL of station 5 is 100.00 m, the RL of station 1 is _____.

54. Factor of safety of the soil against shear failure along the slip circle as shown in Fig. below is
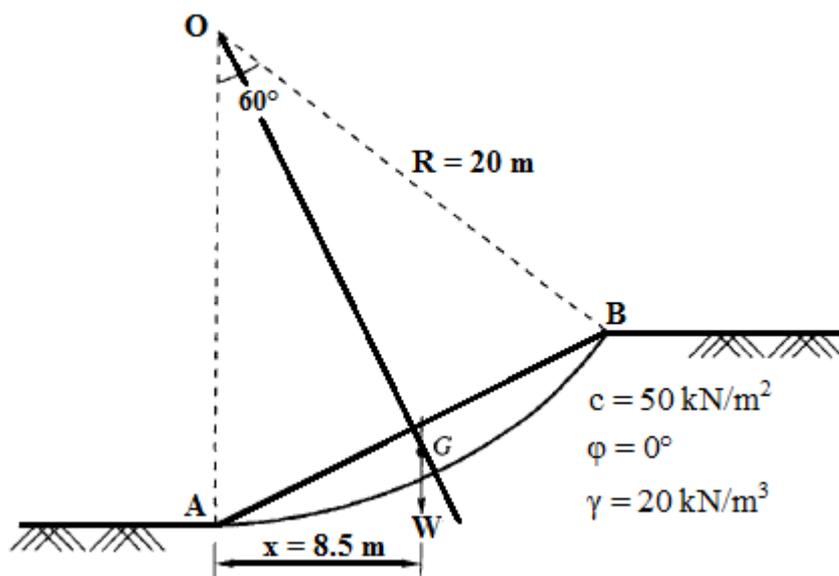
a) 1.87

b) 2.47

c) 2.93

d) 3.41

55. A rectangular beam with b = 250 mm, d = 350 mm and 6 m effective span is to carry a factored load of 18 kN/m including its self weight. The area of tension steel (mm^2) required to carry the above load (upto 2 decimal places) is _____. (Assume M 25 concrete and Fe 415 steel)

56. Synonym : Inexplicable

   a) Unaccountable

   b) Confusing

   c) Understandable

   d) Chaotic

57. Mr. Avtaar Sharma is a candid politician. The meaning of the word candid is

   a) Frank

   b) Faithful

   c) Fearless

   d) Soft spoken

58. Find out which part of the sentence has an error

   One of the most (a) / widely spread (b) / bad habit (c) / is the use of tobacco (d).

59. If DIAMOND is coded as VQYMKLV, how is FEMALE coded?

   a) TUMYNU

   b) UVNZOV

   c) UVNYNV

   d) TVNYNV

60. Statements: All apples are oranges

   No orange is mango

   Which of the following conclusion is correct?

   a) No apple is mango

   b) Some apples are mango

   c) All oranges are apples

   d) Some mangoes are apples

61. A student multiplied a number by 3/5 instead of 5/3. The percentage error in the calculation is

   a) 34%

b) 44%

c) 54%

d) 64%

62. The price of a car is Rs 3,25,000. It was insured to 85% of its price. The car got completely damaged in an accident and the insurance company paid 90% of the insurance. The difference between the price of the car and the amount received is

a) Rs 32,500

b) Rs 48,750

c) Rs 76,375

d) Rs 81,250

63. A manufacturer undertakes to supply 2000 pieces of a particular component at Rs 25 per piece. According to his estimates, even if 5% fail to pass the quality tests, then he will make a profit of 25%. However, as it turned out, 50% of the components were rejected. The loss to the manufacturer is

a) Rs 12,000

b) Rs 13,000

c) Rs 14,000

d) Rs 15,000

64. A boy goes to his school from his house at a speed of 3 km/h and returns at a speed of 2 km/h. If he takes 5 hours in coming and going, the distance between school and house is

a) 5 km

b) 6 km

c) 12 km

d) None of these

65. A particle moves along a horizontal path with a velocity $v = 3t^2 - 6t$, where v is in metres and t is in seconds. The distance travelled by the particle in 4 seconds is

a) Zero

b) 16 m

c) 20 m

d) 24 m