# MOCK – 1
# 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.
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1. If A is a square matrix and $A^T$ is its transpose, which one of the following is correct

   1) A can be written as a sum of symmetric and skew symmetric matrix

   2) $A + A^T$ is a skew symmetric matrix

   a) Only 1

b) Only 2

c) Both 1 & 2

d) None

2. High strength concrete is used in prestressed member

   1) To overcome high bearing stresses developed at the ends

   2) To overcome cracks due to shrinkage

   Which of the above is correct

   a) Only 1

   b) Only 2

   c) Both 1 & 2

   d) None

3. For a rectangular foundation of width b, eccentricity of load should not exceed

   a) b/2

   b) b/3

   c) b/4

   d) b/6

4. The flow with velocity vector **v = yi** is compressible/incompressible ?

5. Hydrograph is a graphical representation of

   a) Surface run off

   b) Ground water flow

   c) Rain fall

   d) None of these

6. The efficiency of sedimentation tank does not depend upon

   a) Depth of tank

   b) Length of tank

   c) Detention period

   d) Velocity of water

7. Consider the following statements:

   1) Sand consists of coarse particles of silica formed due to the disintegration of rocks

   2) The grains of sand are not affected by frost

3) Sand beds are permeable and do not allow water to rise up between pores due to capillary action

Which of the above statements are correct

a) Only 3

b) Only 1 & 3

c) Only 2 & 3

d) All are correct

8. Consistency Index for a clay soil with LL = Liquid Limit, PL = Plastic Limit, W = Natural Moisture content is:

a) $\frac{LL-W}{LL-PL}$

b) $\frac{W-PL}{LL-PL}$

c) $\frac{W}{LL-PL}$

d) $\frac{LL-PL}{W}$

9. Equation of continuity of flow is based on the principle of conservation of

a) Energy

b) Momentum

c) Mass

d) None of these

10. Point of contraflexure may be defined as the point at which

a) Bending moment change signs

b) Curvature change signs

c) Bending moment is maximum

d) Both a and b

11. If $\begin{vmatrix} 6i & -3i & 1 \\ 4 & 3i & -1 \\ 20 & 3 & i \end{vmatrix}$ = x + iy, then

a) x = 3, y =2

b) x=1, y=3

c) x=0, y=3

d) x=0, y=0

12. The stress necessary to initiate yielding, is considerably

    a) More than that necessary to continue it

    b) Less than that necessary to continue it

    c) Equal to that necessary to continue it

    d) Can be less or more than that necessary to continue it

13. The concrete slump recommended for mass concrete as per IS 456-2000 is

    a) 25 mm to 50 mm

    b) 25 mm to 75 mm

    c) 50 mm to 100 mm

    d) 50 mm to 125 mm

14. If the Ruling gradient on any highway is 3%, the gradient provided on the curve of 300 m radius is

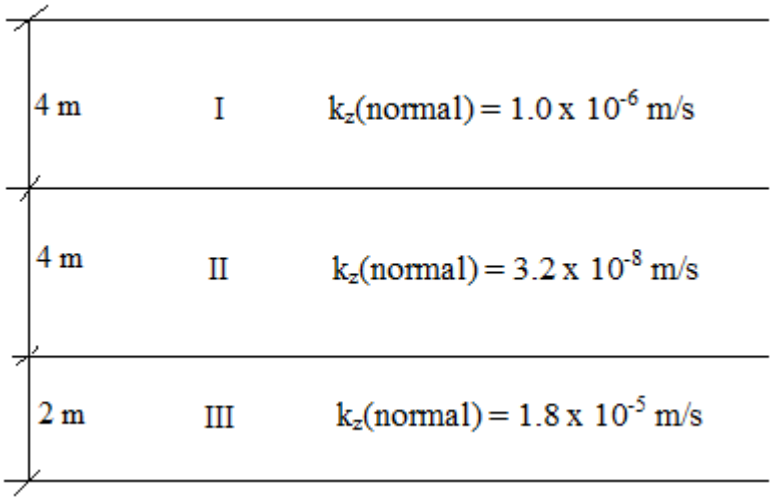
    a) 2 %

    b) 2.5 %

    c) 2.75 %

    d) 3 %

15. A soil profile consists of three layers with the properties as shown below.




The equivalent coefficient of permeability normal to the stratum is

a) 4.01 x $10^{-6}$ m/s

b) $7.75 \times 10^{-8}$ m/s

c) $8.3 \times 10^{-7}$ m/s

d) $1.9 \times 10^{-5}$ m/s

16. The centre of gravity of a homogenous body is the point at which the whole _____ of the body is assumed to be concentrated

a) volume

b) area

c) weight

d) All the above

17. Imaginary line passing through points having equal magnetic declination is termed as

a) isogon

b) agonic line

c) isoclinic line

d) none of these

18. Let $A=[a_{jk}]$ is a matrix of order nxn, such that $a_{jk} = j+k-1$. The rank of this matrix for any value of n is

a) 2

b) 3

c) 4

d) Varies with the value of n

19. The minimum value of camber provided for thin bituminous surface hill roads is

a) 2.2%

b) 2.5%

c) 3%

d) 3.5%

20. For flow in a pressure conduit, Darcy weisbach friction factor, f is misjudged by 10%. The percentage error introduced in carrying capacity is

    a) 10%

    b) 5%

    c) 20%

    d) 15%

21. The temporary hardness of water is caused by

    1) Carbonates of Calcium

    2) Bicarbonates of Magnesium

    a) Only 1

    b) Only 2

    c) Both 1 & 2

    d) None

22. Phytometer method is generally used for the measurement of

    a) Interception

    b) Evaporation

    c) Transpiration

    d) None of these

23. For a biased die the probabilities for the different faces to turn up are given below:

| Face | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Prob. | 0.1 | 0.22 | 0.28 | 0.12 | 0.17 | 0.11 |

This die is tossed and you are told that either face 1 or face 2 has turned up. Then the probability that it is face 1 is _____

24. California bearing ratio method of designing flexible pavements is more accurate as it involves

    a) characteristics of soils

    b) traffic intensitites

    c) Both a and b

    d) none of these

25. According to IS 456:2000, the maximum area of tension reinforcement in beams (width-b, depth-D, effective depth-d) shall not exceed

    a) 4% of total cross-section area i.e. 0.04 bD

    b) 4% of effective cross-section area i.e. 0.04 bd

    c) 6% of total cross-section area i.e. 0.04 bD

    d) 6% of effective cross-section area i.e. 0.04 bd

26. The eigenvalues for the matrix given are:

$$\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$$

    a) $e^{i\theta}$

    b) $e^{-i\theta}$

    c) Both

    d) None

27. A random variable X has the probability distribution:

| X | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| P(X) | 0.15 | 0.23 | 0.12 | 0.1 | 0.2 | 0.05 | 0.07 | 0.08 |

    For the event E = { X is a prime number} and F = { X < 4 }, the P ( E U F ) is

a) 0.50

b) 0.77

c) 0.35

d) 0.87

28. The slope of the tangent to a curve at any point is reciprocal of twice the ordinate of that point. The curve passes through (4,3). The curve is a

a) Circle

b) Parabola

c) Hyperbola

d) Ellipse

29. If f(9) = 9, f'(9) = 4, then $\lim_{x\to 9} \frac{\sqrt{f(x)}-3}{\sqrt{x}-3}$ = _____

a) 4

b) 9

c) 0

d) None of these

30. If z = $(\frac{\sqrt{3}}{2}+\frac{i}{2})^5 + (\frac{\sqrt{3}}{2}-\frac{i}{2})^5$ , then

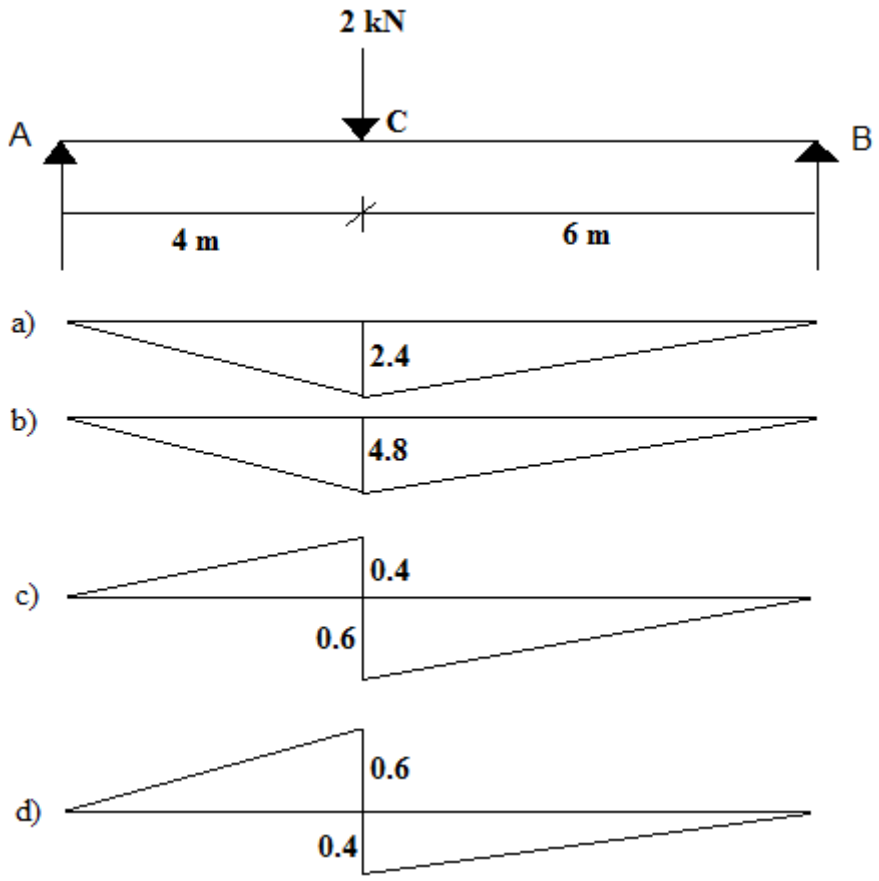
a) Re(z) = 0

b) Im(z) = 0

c) Re(z)>0

d) Im(z)>0

31. The influence line diagram for bending moment at point c of the given simply supported beam is




32. Which of the following statements are true:

1) Void ratio of soil can exceed unity

2) Between bearing capacity and settlement, the proportioning of a footing in sand is more often governed by settlement.

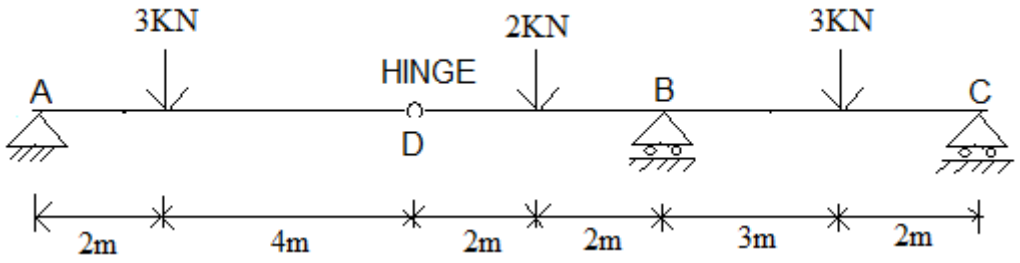
a) Only 1

b) Only 2

c) Both 1 & 2

d) None

33. The reaction at support B of the beam given below is




a) 2.6 KN

b) 5.8 KN

c) 4 KN

d) zero

34. Which of the following statements is/are true

1) Flow at critical depth takes place in an open channel when for a given specific energy, discharge is maximum

2) On an immersed body in a flowing fluid the lift force is always in the opposite direction to the gravity

a) Only 1

b) Only 2

c) Both 1 & 2

d) None

35. The ordinates of a 4-hour unit hydrograph for a particular basin are given below:

| Time(hr) | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 |
|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Discharge(Cumec) | 0 | 25 | 100 | 160 | 190 | 170 | 110 | 70 | 30 |

The peak ordinate of 2-hour unit hydrograph is _____

36. A beam has b = 260 mm, d = 460 mm. The minimum number of reinforcement bars of diameter 20 mm required to carry a factored moment of 165 kNm is _____. Assume M 25 concrete and Fe 415 steel.

a) 2

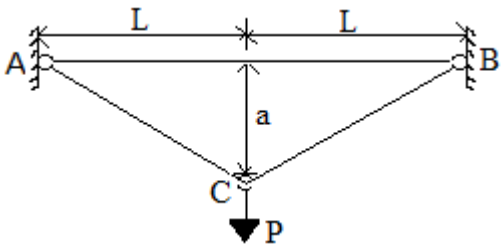
c) 3

c) 4

d) 5

37. A natural soil sample has a bulk density of 20 kN/m$^3$ with 6% water content. The new degree of saturation of the soil, if some amount of water is added to 1 m$^3$ of soil so as to raise its water content to 15% while the void ratio remains constant is _____ (G = 2.67, $\gamma_w$ = 10 kN/m$^3$)

38. Consider two thin rods of same cross sectional area and modulus of elasticity as shown in Fig. which are pinned at A, B, and C and are initially horizontal and of length L when no load is applied. The weight of each rod is negligible. If a force P is then applied (gradually) at point C, then the vertical deflection ('a') produced is approximately related to P as



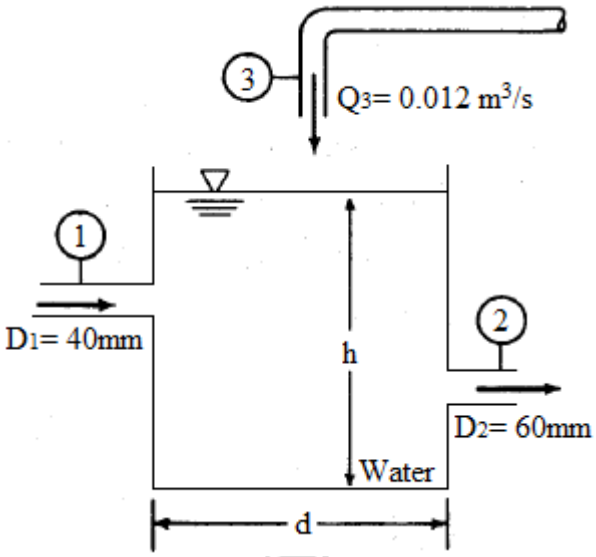

a) P α a

b) P α a$^2$

c) P α a$^3$

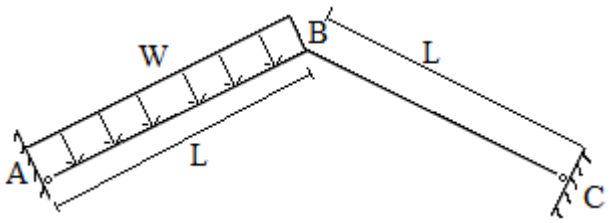
d) P α a$^{3/2}$

39.




In the above figure, the water tank is filled through section 1 at v = 5 m/s and through section 3 at Q = 0.012 $m^3/s$. If the water level h is constant, the exit velocity at 2 will be _____(upto 2 decimal places).

40. Consider the given frame pinned at A and C and loaded as shown below:




Neglecting shortening of the bar BC due to axial compression, the bending moment (BM) at B is

a) $WL^2/2$

b) $WL^2/4$

c) $WL^2/8$

d) $WL^2/16$

41. In a falling head permeameter a soil sample 100 mm in diameter and 1000 mm in length was tested. At the commencement of the test the initial head was 80 cm and after one hour, the head drops to 60 cm. The coefficient of permeability in m/s if the diameter of stand pipe is 2 cm is _____.
42. The field capacity, moisture content before irrigation and the apparent specific gravity of a certain soil is 30%, 20% and 1.5 respectively. If 150 mm of water is applied, the depth of soil irrigated is
    a) 1 m
    b) 1.2 m
    c) 0.8 m
    d) None of these
43. A rectangular concrete beam 200 mm wide and 300 mm deep is prestressed to a stress of 1200 $N/mm^2$ by means of 10 wires of 7 mm diameter located at a depth of 200 mm. If a uniformly distributed live load of 20 kN/m is imposed over a simply supported span of 4m and 15% losses of prestress is assumed, then the maximum working stress in concrete is _____. ( Density of concrete is 24 $kN/m^3$)

    a) 12.78 $N/mm^2$

    b) 13.33 $N/mm^2$

    c) 14.29 $N/mm^2$

    d) 15.22 $N/mm^2$

44. A solid shaft of radius R is subjected to a torque T. The fraction of T that is resisted by the material contained within the outer region of the shaft, which has an inner radius of R/2 and outer radius R is

a) 38%

b) 50%

c) 78%

d) 94%

45. Which of the following is/are correct:

1) Use of coagulants such as alum results in increase of pH of the treated water

2) Disinfection efficiency of chlorine in water treatment is reduced by increased pH values

a) Only 1

b) Only 2

c) Both 1 & 2

d) None

46. A student trying to test the braking ability of her car determined that she needed 5 metres more to stop her car when driving downhill on a road segment of 5% grade than when driving downhill at the same speed along another segment of 3% grade.The approximate braking distance on the 5% grade if the student is traveling at the test speed in the uphill direction is _____ ( Assume coefficient of friction, f = 0.35)

a) 60 m

b) 80 m

c) 100 m

d) 115 m

47. The following tacheometric observations were made on two points P and Q from station A.

| Staff at | Vertical angle | Staff reading | | |
|---|---|---|---|---|
| | | Upper | Middle | Lower |
| P | -15° | 1.268 | 0.926 | 0.606 |

| | | | | |
|---|---|---|---|---|
| Q | 30° | 1.562 | 1.232 | 0.950 |

The height of the tacheometer at A above the ground was 1.50 m. The stadia constant k and c are respectively 100 and 0.00 m. If the elevation of A is 72.00 m, then the difference in the elevation of P and Q is

a) 9.64 m

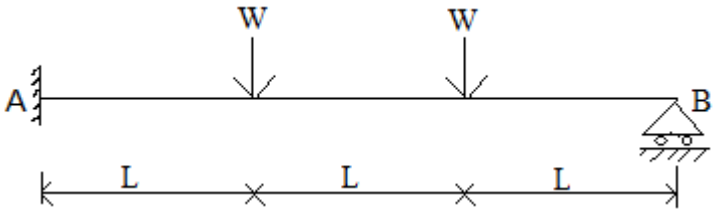
b) 18.72 m

c) 32.58 m

d) 42.74 m

48. A 20 m high vertical retaining wall supports a cohesionless fill of unit weight 18 kN/m$^3$. The upper surface of the fill rises from the edge of the wall at an angle of 10° to the horizontal. The active thrust in kN/m length, if the angle of internal friction and wall friction are 30° and 20° respectively is _____.

49. The figure shows a uniform beam of plastic moment capacity $M_P$.




The ultimate load $W_u$ is

a) $3M_P / 2L$

b) $2M_P / L$

c) $4M_P /3L$

d) $4M_P / L$

50. If a circular sewer of diameter d is hydraulically equivalent to a rectangular sewer (3 sides wetted) of depth D (width = 2 times depth) then d/D is equal to

a) 1.5

b) 1.6

c) 1.7

d) 1.8

51. The following information is available for a seeded 5-day BOD test conducted on a wastewater sample. 10 ml of the waste sample was added directly into a 200 ml BOD incubation bottle. The initial DO of the diluted sample was 8.8 mg/l and the final Do after 5 days was 1.9 mg/l. The corresponding initial and final DO of the seeded dilution water was 9.1 and 7.9 mg/l respectively. The 5 day BOD of the wastewater sample in mg/l is ____

52. The owner of a parking garage has observed that 25% of those wishing to park are turned back every day during the open hours of 8 a.m. to 8 p.m. because of lack of parking spaces. An analysis of data collected at the garage indicates that 60% of those who park are commuters, with an average parking duration of 10 hr, and the remaining are shoppers, whose average parking duration is 2 hr. If 25% of those who cannot park are commuters and the rest are shoppers, and a total of 300 vehicles currently park daily in the garage, determine the number of additional spaces required to meet the excess demand. Assume parking efficiency is 0.80.

53. CBR test on a sample of subgrade yielded the following data:

| Penetration (mm) | Load (kN) | Penetration (mm) | Load (kN) |
|---|---|---|---|
| 0.5 | 1.8 | 3.0 | 9.8 |
| 1.0 | 2.9 | 3.5 | 11.3 |
| 1.5 | 3.7 | 4.0 | 12.5 |
| 2.0 | 7.2 | 4.5 | 13.6 |
| 2.5 | 8.9 | 5.0 | 14.8 |

Further, the standard force-penetration relationship for a soil with a 100% CBR is given below.

| Penetration (mm) | Load (kN) | Penetration (mm) | Load (kN) |
|---|---|---|---|
| 2 | 13.6 | 8 | 23.5 |
| 4 | 17.2 | 10 | 27.6 |
| 6 | 20.4 | 12 | 31.9 |

The CBR of the subgrade is

a) 56.24 %

b) 61.38 %

c) 70.05 %

d) 78.72 %

54. In a 1: 10 model of the flow in a spillway, the velocity at point A is 1 m/s and the force exerted on a small area about A is 0.10 N. What would be the force on the corresponding area in the prototype?

a) 100 N

b) 150 N

c) 10 N

d) 0.10 N

55. Two samples of a soil were tested in a triaxial machine.The all round pressure maintained for the first was 2 kg/cm$^2$ and failure occurred at additional axial stress of 7.7 kg/cm$^2$, while for the second these values were 5 kg/cm$^2$ and 13.7 kg/cm$^2$ respectively. The angle of shearing resistance is _____

56. A ludicrous thought flashed through Shankar's mind. The meaning of the word Ludicrous is

a) Simple

b) Profitable

c) Absurd

d) Beautiful

57. Q. Synonym : Assimilate

a) Arrange

b) Integrate

c) Assessment

d) Assemble

58. Q. Fill in the blank with the most suitable word from given alternatives

His bright success was _____ all expectations.

a) beyond

b) above

c) exceeded

d) over

59. In a class of 100 students there are 70 boys whose average marks in a subject are 75. If the average marks of the complete class is 72, then the average marks of the girls are

a) 73

b) 65

c) 68

d) 74

60. Five children were administrated psychological tests to know their intellectual levels. In the report, psychologists pointed out that the child A is less intelligent than the child B. The child C is less intelligent than the child D. The child B is less intelligent than the child C and child A is more intelligent than child E.

Which child is most intelligent?

(a) A

(b) B

(c) D

(d) E

61. Read the information given and answer the questions that follow:

Rajesh, Anup, Vishwas, Shruti and Bhawana are friends. Their birthdays come in the months from January to May, each person in one of these months. Each like only one item out of chocolates, pastries, burger, pizza and ice cream. The one who likes pastries is born in the month of March. Bhawana does not like ice cream. Rajesh birthday comes in Feb and he likes chocolates. Anup who is fond of burger is born in the next month immediately after Shruti. Shruti does not like ice cream or pizza.

1) What is the choice of Bhawana

a) Pastries

b) Pizza

c) Burger

d) Cannot be determined

2) In which month was Vishwas born?

a) Jan

b) Mar

c) May

d) Cannot be determined

62. There are 5 bus stops A,B,C,D & E at equal intervals. C is not the middle stop. A & E are not the terminal stops. C comes twice as many stops before D in the upward journey as B comes after A in the downward journey. D is first stop in the downward journey. The correct sequence of the bus stops in the downward journey is

a) DACEB

b) DAECB

c) DCBAE

d) DEACB

63. A boy cycled 90 metres eastwards, turned right and moved for 20 metres and again turned right and moved 30 metres and finally moved 100 metres northwards. His distance from the initial position is

a) 80 m

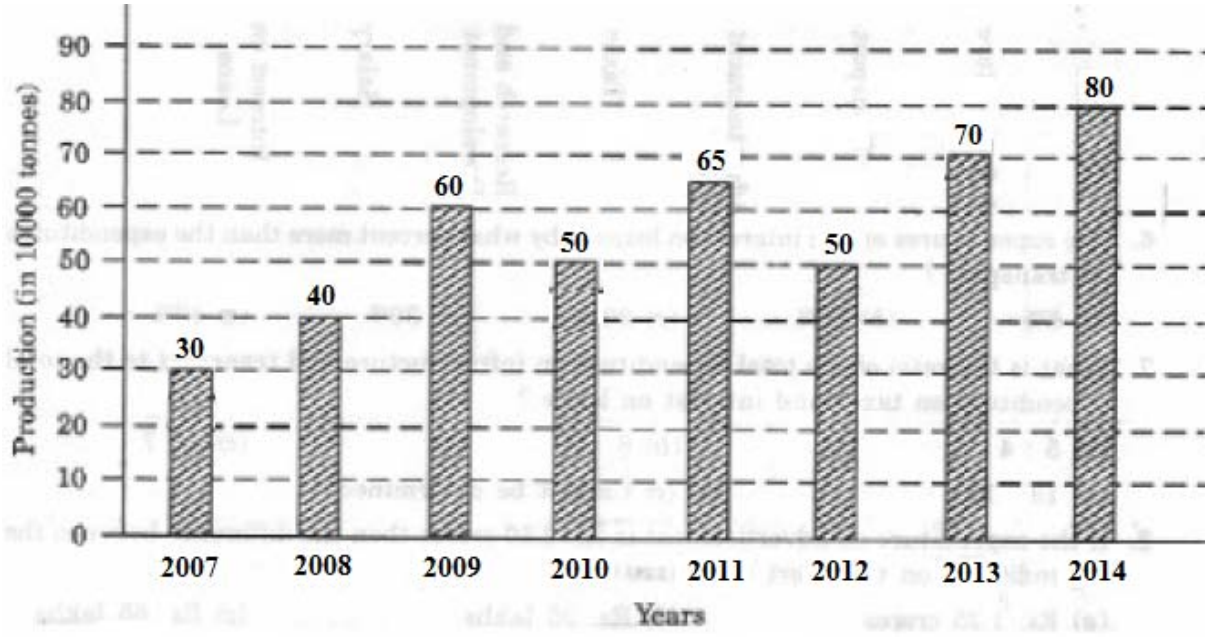
b) 100 m

c) 240 m

d) None of these

64. During one year, the population of a town increased by 5% and during the next year, the population decreased by 5%. The total population is 9975 at the end of the second year. The population size in the beginning of the first year was _____.

65. Production of the cement by ABC construction is shown below:




In how many years was the production of cement more than the average production of the given years

a) 1

b) 2

c) 3

d) 4