

GENERAL APTITUDE

Q1. Some students were not involved in the strike.

If the above statement is true, which of the following conclusion is/are logically necessary?

1. Some who were involved in the strike were students.
2. No students were involved in the strike.
3. At least one student was involved in the strike.
4. Some who were not involved in the strike were students.

- A. 1 and 2
- B. 3
- C. 4
- D. 2 and 3

Answer: C

Q2. Five members 10, 7, 5, 4 and 2 are to be arranged in a sequence from left to right following the directions given below:

1. No two odd or even numbers are next to each other.
2. The second number from the left is exactly half of the left-most number.
3. The middle number is exactly twice the right most number.

Which is second number from the right?

- A. 2
- B. 4
- C. 7
- D. 10

Answer: C

Explanation: The sequence following given conditions will be;

10 – 5 – 4 – 7 – 2

Q3. Until Iran came along, India had never been _____ in kabaddi.

- A. Defeated
- B. Defeating
- C. Defeat
- D. Defeatist

Answer: A

Q4. The fisherman, _____ the flood victims owed their lives were rewarded by the government.

- A. whom
- B. to which
- C. to whom
- D. that

Answer: C

Q5. The radius as well as the height of a circular cone increases by 10%. The percentage increase in its volume is _____.

- A. 17.1
- B. 21.0
- C. 33.1
- D. 72.8

Answer: C

Explanation: Initial volume of cone = $\pi r^2 h / 3$

Changed volume of cone = $\pi / 3 \times (1.1r)^2 \times 1.1h = 1.331 \times \pi r^2 h / 3 = 1.331$ Original volume

Q6. Two trains started at 7AM from the same point. The first train travelled north at a speed of 80km/h and the second train travelled south at a speed of 100km/h. The time at which they were 540km apart is _____AM.

- A. 9
- B. 10
- C. 11
- D. 11.30

Answer: B

Explanation: Say the trains are 540 km apart after 'a' hours

- ⇒ $80a + 100a = 540$
- ⇒ $180a = 540$
- ⇒ $a = 540/180 = 3$
- ⇒ Time at this instance = 3 hours after 7AM = 10 AM

Q7. Since the last one year, after a 125 basis point reduction in repo rate by the reserve Bank of India, banking institutions have been making a demand to reduce interest rates on small saving schemes. Finally, the government announced yesterday a reduction in interest rates on small saving schemes to bring them on par with fixed deposit interest rates.

Which one of the following statements can be inferred from the given passage?

- A. Whenever the Reserve Bank of India reduces the repo rate, the interest rates on small saving schemes are also reduced.

- B. Interest rates on small saving schemes are always maintained on par with fixed deposit interest rate.
- C. The government sometimes takes into consideration the demand of banking institutions before reducing the interest rates on small saving schemes.
- D. A reduction in interest rates on small saving schemes follows only after a reduction in repo rate by the Reserve Bank of India.

Answer: C

Q8. In a country of 1400million population, 70% own mobile phone. Among the mobile phone owners, only 294 million access the Internet. Among these Internet users, only half buy goods from e-commerce portals. What is the percentage of these buyers in the country?

- A. 10.50
- B. 14.70
- C. 15.00
- D. 50.00

Answer: A

Explanation: $(294/2)/1400 = 0.105 = 10.5\%$

Q9. "I read somewhere that in ancient times the prestige of a kingdom depended upon the number of taxes that it was able to levy on its people. It was very much like the prestige of a head-hunter in his own community."

Based on the paragraph above, the prestige of a head-hunter depended upon _____

- A. The prestige of the kingdom
- B. The prestige of the heads
- C. The number of taxes he could levy
- D. The number of heads he could gather

Answer: D

Q10. The nomenclature of Hindustani music has changed over the centuries. Since the medieval period dhrupad styles were identified as *baanis*. Terms like *gayaki* and *baaj* were used to refer to vocal and instrumental styles, respectively. With the institutionalization of music education the term *gharana* became acceptable. *Gharana* originally referred to hereditary musicians from a particular lineage, including disciples and grand disciples.

Which one of the following pairings is NOT correct?

- A. *Dhrupad, baani*
- B. *Gayaki, vocal*
- C. *Baaj, institution*
- D. *Gharana, lineage*

Answer: C

ARCHITECTURE

Q1. Identify the role of Vermiculite in vertical landscapes

- A. Fertilizer
- B. Holding material
- C. Binding material
- D. Water retention element

Answer: D

Explanation: Vermiculite is a naturally occurring mineral that is mined and processed into a puffy, lightweight granule mixed with soil to improve aeration and drainage.

Q2. The term 'Necropolis' refers to

- A. Organically growing settlement
- B. Origin of a settlement
- C. A dead settlement
- D. Merging of two settlement

Answer: C

Explanation: The word 'Necropolis' stems from the Ancient Greek 'Nekropolis', literally meaning "city of the dead".

Q3. The ingredient to be added to produce Aerated Cement Concrete, is

- A. Aluminium
- B. Calcium chloride
- C. Gypsum
- D. Sulphur

Answer: A

Explanation: In ACC blocks, Aluminium powder is used at a rate of 0.05%–0.08% by volume (depending on the pre-specified density). Aluminum powder reacts with calcium hydroxide and water to form hydrogen. The hydrogen gas foams and doubles the volume of the raw mix creating gas bubbles.

Q4. Complementary colours in a Munsell pigment colour wheel refers to

- A. Colours in alternate positions
- B. Colours opposite to one another
- C. Colours adjacent to each other
- D. A pair of secondary colours

Answer: B

Explanation: Complementary colors are pairs of colors which, when combined or mixed, cancel each other out by producing a grey-scale color like white or black. When placed next to each other, they create the strongest contrast for those two colors. Complementary colors may also be called "opposite colors."

Q5. Which of the following parameters is essential to estimate the Envelope Performance Factor (EPF) of a building as per the Energy Conservation Building Code (ECBC), 2011?

- A. Building Type
- B. Maximum humidity
- C. Maximum and minimum monthly temperature
- D. Building occupancy duration

Answer: D

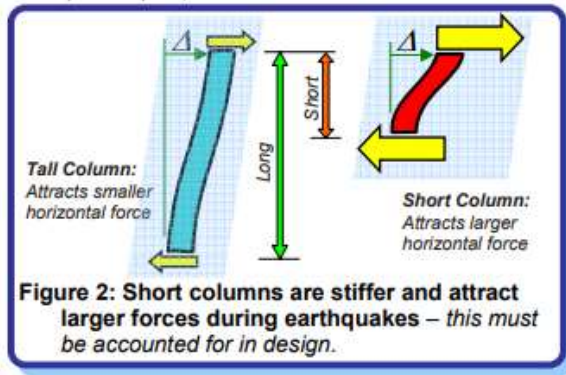
Explanation: Refer to 'Appendix D: Building Envelop Trade-off Method' of ECBC User Guide 2011.

Q6. The cause of short column effect, during seismic occurrence, is due to

- A. Centralized rupture of the column
- B. Tearing of reinforcement bars
- C. Buckling of columns
- D. Stress concentration

Answer: C

Explanation: Poor behaviour of short columns is due to the fact that in an earthquake, a tall column and a short column of same cross-section move horizontally by same amount Δ (Figure below). However, the short column is stiffer as compared to the tall column, and it attracts larger earthquake force. [Source: IITK – BMTPC. Learning Earthquake design and Construction]



Q7. The illumination level of a room is 300lux and the efficacy of the lamps is 60. The Light Power Density (LPD) of the room in Watt/m² is _____.

Answer: 5

Explanation: Illumination, $E = 300 \text{ lux} = 300 \text{ lumen/sq. m}$

Efficacy = 60 lumen/watt

LPD = Illumination/Efficacy = $300/60 = 5 \text{ Watt/sq. m}$

Q8. A sanitary landfill is provided with High Density Poly Ethylene (HDPE) lining along the ground surface. This is provided primarily to prevent

- A. Bleaching
- B. Leaching
- C. Rodents
- D. Plant growth

Answer: B

Explanation: High Density Polyethylene (HDPE) is a common field fabricated geo-membrane material used for lining sanitary landfill to prevent Leachate flow.

Q9. The spherical surface of the geodesic dome comprises of

- A. Equilateral triangles of various sizes
- B. Isosceles triangles of various sizes
- C. Equilateral triangles of uniform size
- D. Isosceles triangles of uniform size

Answer: C

Explanation: A geodesic dome is a hemispherical thin-shell structure (lattice-shell) based on a geodesic polyhedron (a convex polyhedron made from equilateral triangles).

Q10. Typical features of Buddhist architecture are

- A. Mandapa, Chattri, Amalaka, Torana
- B. Stambha, Toana, Vimana, Harmika
- C. Vedika, Chattri, Torana, Harmika
- D. Vedika, Stupa, Chaitya, Vimana

Answer: C

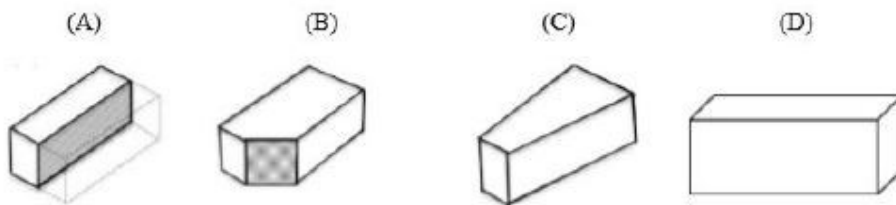
Q11. The abrupt change or junction between two ecological zones is termed as

- A. Ecological niche
- B. Ecosystem
- C. Ecotype
- D. Ecotone

Answer: D

Explanation: An ecotone is a transition area between two biomes. It is where two communities meet and integrate.

Q12. Identify the Queen closure



Answer: A

Q13. Which of the following projection types is adopted in Universal Transverse Mercator (UTM)?

- A. Spherical
- B. Conical
- C. Planar
- D. Cylindrical

Answer: D

Explanation: The UTM projection flattens the sphere 60 times by shifting the cylinder central meridian 6° for each zone. This gives cartographers a map to work with always in meters. The Universal Transverse Mercator (UTM) coordinate system is a grid-based method of specifying locations on the surface of the Earth that is a practical application of a 2-dimensional Cartesian coordinate system. To map any spot on Earth, one picks the UTM Zone centerline that is closest to it and then makes a map using that "UTM Zone" cylindrical projection.

Q14. The load on a RCC column is 150kN. The soil bearing capacity is 80kN/m². Assuming a factor of safety of 1.2, the side of the square column footing is _____ meter (*rounded off to one decimal place*).

Answer: 1.5

Explanation: Load on column = 150 kN

Design load considering factor of safety = $150 \times 1.2 = 180$ kN

Soil bearing capacity = 80kN/m²

Area of footing required = $180/80 = 2.25$ sq. m

Side of footing = $\sqrt{2.25} = 1.5$ m

Q15. The solar protection system consisting of fixed slates or grids, outside a building façade in front of openings, is known as

- A. Brise-soleil
- B. Solarium
- C. Malqaf
- D. Trombe wall

Answer: A

Explanation: 'Brise-Soleil' is an architectural element, which literally means 'Sun Breaker'

Q16. The closing syntax, for an executable command line in C or C++ program, is

- A. :
- B. ,
- C. ;
- D. ,

Answer: C

Q17. Super-elevation of a road with pre-determined radius of curvature is primarily dependent on

- A. Altitude
- B. Soil bearing capacity
- C. Traffic volume
- D. Design traffic speed

Answer: D

Q18. The Indian property inscribed by UNESCO on the World Heritage List in the year 2018 is

- A. Mattanchery Palace, Emakulam
- B. The Victorian Gothic and Art Deco Ensembles of Mumbai
- C. Ancient Buddhist Site, Sarnath
- D. Mughal Gardens in Kashmir

Answer: B

Q19. The purchase price of 2BHK flat rises 10 percent, the demand for such flats is observed to decrease by 8 percent. The given elasticity of the housing demand for 2BHK flats is _____ (rounded off to one decimal place).

Answer: 0.8

Explanation: Price elasticity of demand = Change in quantity / Change in demand = 8 % / 10 % = 0.8

Q20. In mono-centric urban model, land rent is expected to

- A. Diminish as one moves towards the center
- B. Diminish as one moves away from the center
- C. Remain constant across the whole urban area
- D. Be unrelated with distance from center

Answer: B

Q21. Which of the following commands in AUTOCAD is used to create 3D solid between various cross sections?

- A. LOFT
- B. MESH
- C. XEDGES
- D. PFACE

Answer: A

Q22. Fineness modulus of sand measures its

- A. Compressive strength
- B. Grading according to particle size
- C. Bulking of sand
- D. Ratio of coarse and fine sand

Answer: B

Q23. 'Threshold enclosure' created by vertical surface or series of vertical elements in an urban plaza, represented by the ratio of height and distance, is given by an angle of _____ degrees (rounded off to one decimal place)

Answer: 26.5°

Explanation: Ratio of height and distance for 'Threshold of enclosure' = 1/2

$$\tan \theta = 1/2$$

$$\theta = 26.5^\circ$$

Q24. A room is separated by a partition wall. The average intensities of sound in the source and receiving sides across the partition are 10^{-4} W/m^2 and 10^{-7} W/m^2 respectively. The transmission loss (TL) of the partition wall is _____ dB.

Answer: 30

Explanation: Sound level in the portion with source = $10 \log \left(\frac{10^{-4}}{10^{-1}} \right) = 80 \text{ dB}$

Sound level in the portion with receiver = $10 \log \left(\frac{10^{-7}}{10^{-12}} \right) = 50 \text{ dB}$

Transmission loss due to partition = $80 - 50 = 30 \text{ dB}$

Q25. Name the architect who criticized ornament in useful objects in his essay 'Ornament and Crime'

- A. John Ruskin
- B. HP Berlage
- C. Adolf Loos
- D. Walter Gropius

Answer: C

Q26. The stack pressure is created by 10m height of stack and 15°C temperature difference. The motive force due to the stack pressure over a cross section area of 2.5m^2 is _____ N.

Answer: 15.75

Explanation: Stack pressure in N/sq.m, $P = 0.042 \times h \times dT$

Stack pressure = $0.042 \times 10 \times 15 = 6.3 \text{ N/ sq.m}$

Stack pressure over given cross-sectional area = $6.3 \times 2.5 = 15.75 \text{ N}$

Q27. Match the units in Column I with their corresponding items in Column II and select the appropriate option

Column I	Column II
P. dB	1. Sound Intensity
Q. Phon	2. Absorption of sound
R. W/m^2	3. Frequency of sound
S. Sabine	4. Loudness
	5. Sound pressure level

- A. P-5,Q-1,R-4,S-3
- B. P-2,Q-3,R-4,S-5
- C. P-1,Q-2,R-3,S-4
- D. P-5,Q-2,R-1,S-2

Answer: D

Q28. Match the characteristics of settlement systems in Column I with their corresponding theory/rules in column II and select appropriate option.

Column I	Column II
P. Primacy of settlements	1. Central place theory
Q. Settlement size and location	2. Gravity model
R. Random component in location of settlement	3. Rank size rule
S. Interactions between settlements	4. Entropy of settlements
	5. Core periphery model

- A. P-4,Q-1,R-2,S-5
- B. P-2,Q-5,R-3,S-1
- C. P-3,Q-5,R-4,S-2
- D. P-3,Q-1,R-4,S-2

Answer: D

Q29. A residential area of 20 hectares is planned for three different types of plots of 500m², 300m² and 200m² with numbers of plot in each category are 100, 120, 150 respectively. The rest of the area is allowed for roads and facilities such as school, shops and parks. Each plot has one dwelling unit and the average household size is 5 persons. The net residential density of the area in person per hectare is _____.

Answer: 159 – 160

Explanation: Total area = 20 Ha = 20

Type	Area per plot (sqm)	Number	Total Area (type)
1	500	100	50000
2	300	120	36000
3	200	150	30000

Total number of plot = 100 + 120 + 150 = 370

Number of DU = 370 x 1 = 370

Population = 370 x 5 = 1850 person

Net are = total area of plot = 50000 + 36000 + 30000 = 116000 sqm. i.e. 11.6 ha

Net residential density = population / net area = 1850 / 11.6 = 159.48 pph


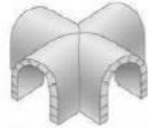


Q30. A room having dimension 12m x 10m x 3.5m is required to be mechanically ventilated by air-conditioner. The temperature difference outdoor ambient air and the supply air is 12°C. Consider three air exchanges per hour. The volumetric specific heat of the air is 1250J/m³°C. Assume one ton of refrigeration (TR) is equal to 3.5kW. The capacity of the air-conditioner for the room in TR will be _____.

Answer: 1.5

Explanation: Rate of ventilation = $(12 \times 10 \times 3.5 \times 3)/3600 = 0.35$

Cooling load = $1250 \times 0.35 \times 12 = 5.25 \text{ kW} = 1.5 \text{ TR}$

Q31. Match the figures of vault in Column I with their corresponding types in column II and select the appropriate option.

Column - I		Column - II	
P		1	Ribbed
Q		2	Fan
R		3	Barrel
S		4	Groin
		5	Nubian

- A. P-3,Q-4,R-1,S-2
- B. P-3,Q-1,R-4,S-5
- C. P-2,Q-1,R-5,S-3
- D. P-2,Q-3,R-1,S-5

Answer: A

Q32. Match the scientific names of the trees provided in Column I with the corresponding colour of their bloom in Column II, and select the appropriate option.

Column I	Column II
P. <i>Cassia fistula</i>	1. White
Q. <i>Lagerstroemia flos-reginae</i>	2. Red
R. <i>Cordia sebastena</i>	3. Blue
S. <i>Piumeria alba</i>	4. Yellow
	5. Mauve

- A. P-4,Q-5,R-4,S-1
- B. P-1,Q-5,R-2,S-3
- C. P-5,Q-4,R-1,S-3
- D. P-4,Q-5,R-2,S-1

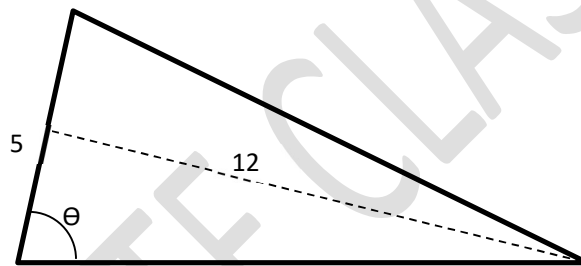
Answer: D

Q33. A cone, with a base of 10cm diameter and axis of 12cm, is lying on Horizontal Plane (HP) along its generator. The internal angle which is the base of the cone makes with HP is _____ degrees.

Answer: 67.38

Explanation: In below diagram, $\tan \theta = 12/5$

$$\Rightarrow \theta = \tan^{-1}(12/5) = 67.38 \text{ degree}$$



Q34. A power shovel is having 1.8m^2 excavation output per batch of operation. The average cycle time of the batch operation is 45 seconds. The lost time per hour of the excavation activity is 10 minutes. Assume six working hours of operation per day. The amount of soil excavated by the power shovel per day is _____ m^3 (rounded of to one decimal place).

Answer: 720

Explanation: Effective operating time = 300 min (Considering 10 min loss per hour)

$$\text{Volume of soil excavated} = (300 \times 60 \times 1.8)/45 = 720 \text{ cu. m}$$

Q35 The internal dimension of a room is $10\text{m} \times 10\text{m} \times 4\text{m}$ (height). The total area of the doors and windows are 16m^2 . Keeping the doors and windows closed, the reverberation time of the room becomes 1.2 second. Assume all the interior surfaces including doors and windows have some absorption coefficient. If all doors and windows of the room are kept fully open, the reverberation time will be _____ second (rounded of to one decimal place).

Answer: 1.26

Explanation: Consider the uniform absorption coefficient = a

$$\text{Using, } RT = 0.16V/A$$

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- ⇒ $1.2 = 0.16 \times 400/360a$ [Since total surface area of room is 360]
- ⇒ $360a = 400 \times 0.16/1.2$
- ⇒ $a = 0.148148$

New RT = $0.16 \times 400/(344a)$ [Area = Total – Fenestration = 360 – 16]

⇒ $RT = (0.16 \times 400)/(344 \times 0.148148) = 1.2558 \text{ sec}$

Q36. An industrial building contains 3000 kg of combustible materials, in dry state, distributed over three rooms of area 100m², 500m² and 300m² each, in a proportion of 30%, 50% and 20% of the contents, respectively. Calorific value of the material is 4400kCal/kg. The Total fire load of the rooms is equal to _____ kCal/m².

Answer: 61600

Explanation: Fire Load = (Weight x Calorific Value)/Area

Fire load in Room 1 = $(3000 \times 0.3 \times 4400)/100 = 39600 \text{ kCal/m}^2$

Fire load in Room 2 = $(3000 \times 0.5 \times 4400)/500 = 13200 \text{ kCal/m}^2$

Fire load in Room 3 = $(3000 \times 0.2 \times 4400)/300 = 8800 \text{ kCal/m}^2$

Total fire load = $39600 + 13200 + 8800 = 61600 \text{ kCal/m}^2$

Q37. As per the Handbook on Barrier Free and Accessibility, CPWD – 2014, match the design guidelines in Column I with their appropriate standards in Column II and select the appropriate option.

Column I	Column II
P. Minimum clear width of ramp	1. 600mm
Q. Maximum height of wash basin(rim) above finished floor level	2. 1500mm
R. Minimum length of grab rail	3. 750mm
S. Minimum clear width for manoeuvring space (wheel chair)	4. 900mm
	5. 1800mm

- A. P-3,Q-4,R-1,S-5
- B. P-5,Q-3,R-2,S-4
- C. P-5,Q-3,R-1,S-2
- D. P-1,Q-4,R-3,S-1

Answer: C

Q38. Match the thermal properties in the column I and their respective units in Column II and select the appropriate option.

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Column I	Column II
P. Thermal resistance	1. $\text{J kg}^{-1} \text{ } ^\circ\text{C}^{-1}$
Q. Thermal Transmittance	2. $\text{Wm}^{-1} \text{ } ^\circ\text{C}^{-1}$
R. Specific heat	3. $\text{Wm}^{-2} \text{ } ^\circ\text{C}^{-1}$
S. Thermal Conductivity	4. $\text{m}^2 \text{ } ^\circ\text{C W}^{-1}$
	5. $\text{J m}^{-3} \text{ } ^\circ\text{C}^{-1}$

- A. P-4,Q-1,R-5,S-2
- B. P-4,Q-3,R-1,S-2
- C. P-5,Q-3,R-1,S-4
- D. P-3,Q-4,R-2,S-1

Answer: B

Q39. For a symmetrical trapezoidal open drain in a landscape with grass and loose rock, surface, the velocity of flow of water is ___ m/sec, (round off to two decimal places), given the following data.

Water edge width at the top = 750mm

Water edge width at the bottom = 45000mm

Water depth = 600mm

Manning's coefficient of roughness = 0.05

Slope along the drain = 1 in 250

Answer: 0.4517

Explanation: Velocity in m/sec = $1/n \times r^{2/3} \times S^{1/2}$

Here, $n = 0.05$

Hydraulic radius, $r = \text{Wet area/Wet perimeter} = 0.36/1.6869 = 0.2134 \text{ m}$

$S = 1/250 = 0.004$

$$\Rightarrow \text{Velocity} = 1/0.05 \times (0.2134)^{2/3} \times (0.004)^{1/2} = 0.4517 \text{ m/sec}$$

Q40. Match the instruments in Column I with the various types of surveying in Column II and select the appropriate option.

Column I	Column II
P. Cross staff	1. Indoor wall to wall measurement
Q. Alidade	2. Traversing
R. Sextant	3. Chain survey
S. Distomat	4. Plane table survey
	5. Contour survey

- A. P-3,Q-4,R-2,S-5

- B. P-2,Q-4,R-1,S-5
- C. P-5,Q-3,R-2,S-1
- D. P-3,Q-4,R-2,S-1

Answer: D

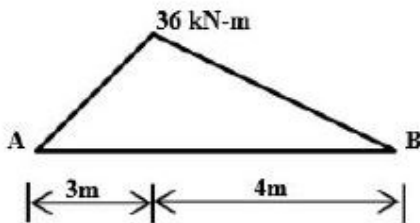
Q41. Match the application in the field of construction in the Column I and the respective items in Column II and select appropriate option

Column I	Column II
P. Polytetrafluoroethylene (PTFE) membrane	1. Tendon
Q. Isolated compression component inside a network of continuous tensile member	2. TMT
R. Cable used for pre-stressed concreting	3. Tensegrity
S. Reinforcement bar used in RCC construction	4. TMD
	5. Teflon

- A. P-5,Q-1,R-4,S-3
- B. P-4,Q-3,R-1,S-5
- C. P-5,Q-3,R-1,S-2
- D. P-3,Q-4,R-2,S-1

Answer: C

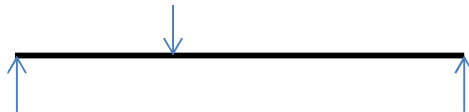
Q42. A simply supported beam AB has a clear span of 7 meter. The bending moment diagram (BMD) of the beam due to a single concentrated load is shown in the figure below.



The magnitude of the concentrated load in kN is _____.

Answer: 21

Explanation: For eccentric point load on simply supported beam;



Moment along any plane xx' , $M_x = R_A * x = Wb * x/L$

$\Rightarrow M_x = Wbx/L$

\Rightarrow Maximum Bending Moment = $Wab/L = (W \times 3 \times 4)/7$

$$\Rightarrow 36 = 12W/7$$

$$\Rightarrow W = (36 \times 7)/12 = 21$$

Q43. Solar panels are proposed to be installed on a building roof top to generate electricity. The size of each solar panel is 2m^2 . The efficiency of each panel is 75%. The orientation of the solar panel and related solar data are given in the table below.

Orientation	No. of panel	Average daily solar radiation in W/m^2	Average solar hours per day
South	10	400	4
West	5	300	2

As per above proposal _____ kWh solar power will be generated daily (*rounded off to one decimal place*).

Answer: 28.5

Explanation: Solar power generated = Avg solar radiation x Area x Average solar hours x Efficiency

$$\Rightarrow \text{Solar power from south orientation} = 400 \times 20 \times 4 \times 0.75 = 24 \text{ kWh}$$

$$\Rightarrow \text{Solar power from West orientation} = 300 \times 10 \times 2 \times 0.75 = 4.5 \text{ kWh}$$

$$\Rightarrow \text{Total solar power generated} = 24 + 4.5 = 28.5 \text{ kWh}$$

Q44. A colony of 50 people is served by a septic tank. The rate of water supply is 90lped in the colony and 40% of it is going to the septic tank. The retention period of the tank is 24 hours. The length of the septic tank is _____ meter (*rounded off to two decimal places*).

Assume, storage capacity/person = 0.085m^3 (year)

Space for digestion = 0.0425m^3 /person

Depth of tank = 1.4m

Length: Width = 2:1

Answer: 3.42

Explanation: Water in septic tank = $50 \times 90 \times 1 \times 0.4 = 1.8 \text{ cu. m}$ (40% of total consumption)

Storage volume of septic tank = $0.085 \times 50 = 4.25 \text{ cu. m}$

Digestion volume of septic tank = $0.0425 \times 50 = 2.125 \text{ cu. m}$

Total volume = $1.8 + 4.25 + 2.125 = 8.175 \text{ cu. m}$

Area of plane = Volume/height = $8.175/1.4 = 5.8393 \text{ Sq. m}$

If width is 'a', length will be '2a'

$$\Rightarrow 2a^2 = 5.8392$$

$$\Rightarrow a = \text{sqrt}(2.9196) = 1.7087$$

$$\Rightarrow \text{Length of septic tank} = 2a = 2 \times 1.7087 = 3.4174 \text{ m}$$

Q45. Match the items in Column I and their respective location in building/site in Column II, and select the appropriate option.

Column I	Column II
P. Nahani Trap	1. Between waste water pipe and main house drain
Q. Gully Trap	2. Between septic tank and soak pit
R. Bottle Trap	3. Junction of house drain and sewer
S. Intercepting Trap	4. Bathroom and kitchen floor
	5. Below wash basin

- A. P-4,Q-5,R-2,S-3
- B. P-5,Q-1,R-3,S-2
- C. P-4,Q-1,R-5,S-3
- D. P-3,Q-4,R-5,S-2

Answer: C

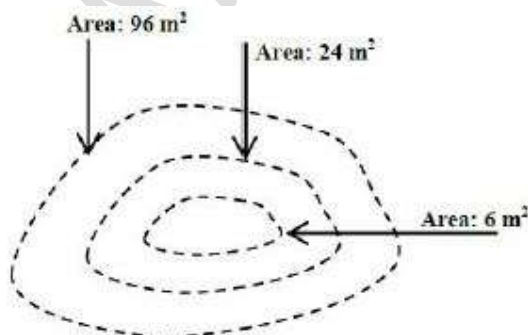
Q46. Match the following in Column I with their suitable description in Column II, and select the appropriate option.

Column I	Column II
P. Tolerance	1. 100mm
Q. Precast concrete rings for wells	2. Non modular dimension
R. M	3. Acceptable variation
S. Weather joints	4. 3D- prefabricate
	5. Resilient sealants

- A. P-2,Q-4,R-1,S-3
- B. P-2,Q-4,R-3,S-5
- C. P-1,Q-2,R-3,S-4
- D. P-3,Q-4,R-1,S-5

Answer: D

Q47. A depressed portion of a land is identified by three closed contours, as shown in the figure below. The area bound by three contour lines is 6m^2 , 24m^2 and 96m^2 respectively.



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The contour interval is 1m. Using prismoidal method, the volume of the earth needed to fill land depression is _____m³.

Answer: 99

Explanation: Prismoidal formula is a formula used in the calculation of earthwork quantities. It states that the volume of any prismoid is equal to one-sixth its length multiplied by the sum of the two end-areas plus four times the mid-area.

$$\text{Volume of earth-fill} = h/6 (A1 + 4Am + A2)$$

$$\text{Depth of depression, } h = 3 \times 1 = 3$$

$$\Rightarrow \text{Volume of earth-fill} = 3/6 (96 + 6 + 24 \times 4) = 198/2 = 99$$

Q48. A public utility building of 5000m² was constructed 5 years before, on a site of 1 hectare. The present value of open land in that location is Rs. 100/m² and present construction cost of such building is Rs. 2500/m². If the value of the building is assumed to be depreciating at a constant rate of 6 percent per annum, then the present value of the property using 'Valuatin by Cost Method' is _____ (in Rs. Lakh) (rounded off to one decimal place).

Answer: 101.7

Explanation: Present land value = 100 x 10000 rupees = Rs. 10 Lakh

$$\text{Value of new construction} = 5000 \times 2500 = 125 \text{ lakh}$$

Depreciating at a constant rate of 6 %

$$\text{Value after depreciation of construction in 5 years} = 125 (1 - r)^n = 125 \times (1 - 0.06)^5 = 91.738 \text{ lakh}$$

$$\text{Present value of property} = 91.738 + 10 = 101.738 \text{ lakh}$$

Q49. Match the Name of book provided in Column I with the corresponding author in Column II and select the appropriate option.

Column I	Column II
P. Earthscape	1. Ian McHarg
Q. Synthesis of form	2. John O Simonds
R. Design with nature	3. Christopher Alexander
S. The city of tomorrow and its planning	4. Lewis Mumford
	5. Le Corbusier

- A. P-2,Q-3,R-1,S-5
- B. P-5,Q-2,R-3,S-4
- C. P-5,Q-3,R-1,S-4
- D. P-2,Q-1,R-4,S-5

Answer: A

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Q50. In a site map, a rectangular residential plot measures 150mmx40mm, and the depth of the front road in the map measures 16mm. Actual width of the road is 4m. If the permissible F.A.R is 1.2, the maximum built up area for the residential building will be _____ m².

Answer: 450

Explanation: Scale of the map = length on map / actual length = 16 mm / 4 m = 1: 250

Actual dimension of the plot would be

length = 150 x 250 = 375000 mm = 37.5 m

width = 40mm x 250 = 10000 mm = 10 m

Area of the site = 37.5 x 10 = 375

Maximum built up area = 375x1.2 = 450 sq.m.

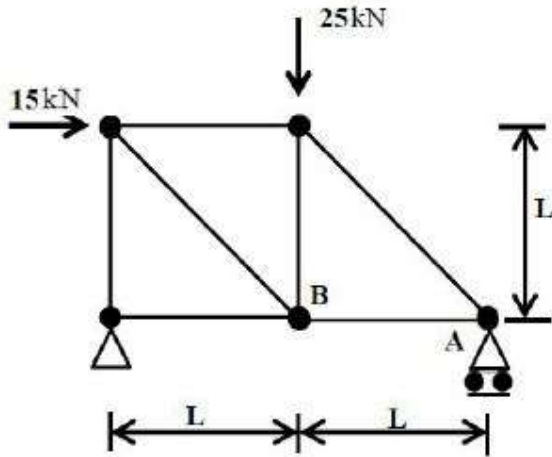
Q51. Match the architectural projects in Column I with the architect in Column II, and select the appropriate option.

Column I	Column II
P. India Habitat Centre, New Delhi	1. Christopher Charles Benninger
Q. United World Colleges (UWC), Mahindra College, Pune	2. Charles Correa
R. Brain and Cognitive Science Centre – MIT, Cambridge	3. Joseph Allen Stein
S. Habitat 67, Montreal	4. Norman Foster
	5. Moshe Safdi

- A. P-3, Q-1, R-2, S-5
- B. P-1, Q-2, R-5, S-3
- C. P-2, Q-1, R-5, S-4
- D. P-3, Q-4, R-1, S-5

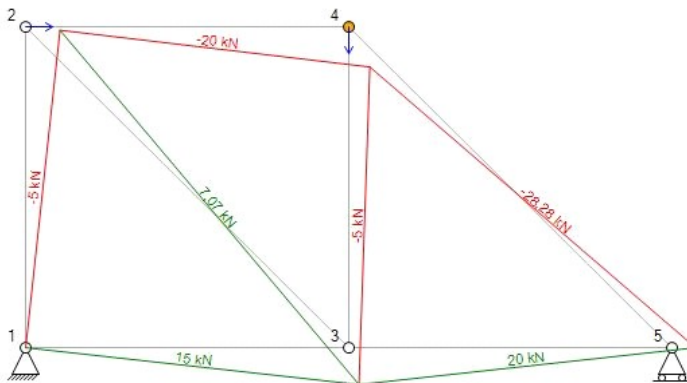
Answer: A

Q52. A simple truss is shown in the figure below. The truss is loaded with horizontal and vertical force 15kN and 25kN respectively. The force in member AB will be _____ kN.







Answer: 20

Explanation:



Q53 Match the following types of masonry joints in Column I with their respective corresponding description in Column II, and select the appropriate option.

Column - I		Column - II	
P		1	Struck
Q		2	Weathered
R		3	Raked
S		4	Beaded
		5	Concave

- A. P-1,Q-3,R-2,S-4
- B. P-4,Q-3,R-2,S-5
- C. P-3,Q-4,R-5,S-2
- D. P-4,Q-3,R-1,S-5

Answer: B

Q54. Match the contemporary Urban Design Movements listed in Column I with the corresponding principles listed in column II and select the appropriate option,

Column I	Column II
P. Park Movement	1. Self-contained, self-sufficient community surrounded by green belts
Q. New Urbanism	2. Revival of the relationship between man and nature
R. City Beautiful Movement	3. Relationship between work and living, environmental sustainability.
S. Garden City and New Town Movement	4. Unity, cohesion and balanced relationship between urban components and elements
	5. Technical and socio economic process resulting in growth, energy production and waste elimination.

- A. P-2,Q-3,R-4,S-1
- B. P-1,Q-5,R-3,S-2
- C. P-5,Q-3,R-1,S-2
- D. P-2,Q-5,R-4,S-1

Answer: A

Q55. In a single lane road, traffic volume of 1000 vehicles/hr moving at 20Km/h, comes to halt due to an accident. If jam density is 150 vehicle/km, the velocity of the shock wave generated (in absolute value) is _____ km/h.

Answer: 100

Explanation: speed of the shock-wave = $Q_2 - Q_1 / K_2 - K_1$

Q_1 = Flow before jam = 1000 V/h

Q_2 = Flow after jam = 0 (Because $V = 0$)

K_1 = Density before the jam = $1000 / 20 = 50$ V/km

K_2 = 150 Vehicle / Km (Jam density)

Speed of the shock-wave = $Q_2 - Q_1 / K_2 - K_1$

Speed of the shock-wave = $0 - 1000 / 150 - 50$

Speed of the shock-wave = $- 1000 / 100$

Speed of the shock-wave = -100