Q : 1) Shear resistance of concrete in a reinforced concrete beam is dependent on

A : Tension reinforcement on the beam

B : Compression reinforcement in the beam

C : Shear reinforcement in the beam

D : None of the reinforcements in the beam

Q : 2) In a reinforced concrete section, the shape of the nominal shear stress diagram is

A : Parabolic over the full depth

B : Parabolic above the neutral axis and rectangular below the neutral axis

C : Rectangular over the full depth

D : Rectangular above the neutral axis and parabolic below the neutral axis

Q : 3) If a 2-legged 8 mm diameter HYSD bar is used as shear reinforcement for a beam of width 230 mm and effective depth 300 mm, what is the nearest magnitude of the spacing of minimum shear reinforcement?

A : 420 mm

B : 390 mm

C : 350 mm

D : 320 mm

Q : 4) As per IS 456-2000, the maximum permissible shear stress, $\tau_{c\ max}$ is based on

A : Diagonal tension failure

B : Diagonal compression failure

C : Flexural tension failure

D : Flexural compression failure

Q : 5) A simply supported beam having 200 mm width and 450 mm effective depth supports a total uniformly distributed load of 2,00,000 N. The nominal shear stress will be nearly

A : 0.8 N/mm²

B : 1.1 N/mm²

C : 1.8 N/mm²

D : 2.2 N/mm²

Q : 6) In limit state design, permissible bond stress in the case of deformed bars is more than that in plain bars by

A : 60%

B : 50%

C : 40%

D : 25%

Q : 7) Consider the following statements

1. Reinforcement that is no longer required for flexure beyond a certain section, shall however be extended by d or 12ϕ, whichever is greater, before being curtailed

2. At least half the bars should be bent up at the cut-off point

3. The shear capacity at cut-off point should at least be 1.5 times the shear force at that section

Which of the statements given above are correct?

A : 1 and 2   B : 1 and 3

C : 2 and 3   D : 1, 2 and 3

Q : 8) Match List I (Reinforcement type) with List II (anchorage requirement) and select the correct answer using the codes given below the lists

List-I	List-II
A. Footing slab, tensile reinforcement	1. $L_d/3$ into the support
B. Cantilever beam, tensile reinforcement	2. 6ϕ for 135° bend
C. Simply supported beam, tensile reinforcement	3. L_d into the support
D. Beam, shear stirrup	4. L_d from the column face

Codes:

A : 1, 3, 4, 2   B : 1, 2, 4, 3

C : 4, 3, 1, 2   D : 4, 2, 1, 3

Q : 9) The bond between steel and concrete is mainly due to

1. Mechanical resistance

2. Pure adhesive resistance

3. Frictional resistance

A : 1 and 2 only

B : 1 and 3 only

C : 2 and 3 only

D : 1, 2 and 3

Q : 10) If a beam is likely to fail due to high bonding stresses, the its bond strength can be increased most economically by

A : Providing vertical stirrups

B : Increasing the depth of the beam

C : Using smaller diameter bars in correspondingly more numbers

D : Using higher diameter bars by reducing their numbers

Q : 11) Gantt charts indicate

A : Comparison of actual progress with the scheduled progress

B : Balance of work to be done

C : Progressive costs of project

D : Inventory coats

Q : 12) A serious limitation of inter dependences between various activities is generally observed in

A : Bar charts

B : Milestone charts

C : Network analysis

D : Job layouts

Q : 13) Match List-I (Diagram based Nomenclature) with List-II (information capability) and select the correct answer using the code given below the lists:

List-I	List-II
A. Work-breakdown structure B. Bar chart C. Linked bar chart D. Time computations on network	1. Target dates for interface events can be stipulated 2. Can be hierarchical 3. Can include information on cost distribution over time 4. Best suited for monitoring on network including that for costs

Codes:

A : 4, 3, 2, 1

B : 2, 1, 4, 3

C : 4, 1, 2, 3

D : 2, 3, 4, 1

Q : 14) Match List-I (Diagram based nomenclature) with List-II (information capability) and select the correct answer using the code given below the lists:

List-I	List-II
A. Work-breakdown structure B. Bar chart C. Linked bar chart D. Time computations on network	1. Target dates for interface events can be stipulated 2. Can be hierarchical 3. Can include information on cost distribution over time 4. Best suited for monitoring on network including that for costs

Codes:

A : 4, 3, 2, 1

B : 2, 1, 4, 3

C : 4, 1, 2, 3

D : 2, 3, 4, 1

Q : 15) What is the significant purpose of monitoring a project throughout its implementation phase?

A : To fix responsibility for delays

B : To rerail the project with control over cost over-run

C : To rerail the project with minimum time over-run

D : To rerail the project with optimal time and cost over-run

Q : 16) Match List I (Chart) with List II (Facilitation) and select the correct answer using the code given below the lists:

List I	List II
A. Bar chart B. Milestone bar chart C. W.B.S D. Linked bar chart	1. Activity dependencies can be implied 2. Resource requirement can be depicted 3. Higher level of authority can effect monitoring & control 4. Trade base site supervision can be assigned

Codes:

A : 4, 3, 2, 1

B : 2, 1, 4, 3

C : 4, 1, 2, 3

D : 2, 3, 4, 1

Q : 17) A bar chart is commonly used because

A : It is simple to draw and easy to understand

B : It indicates at a glance the overall progress of the project

C : It shows critical and non-critical activities

D : It incorporates uncertainties for delay in estimation of time required for completion of activities

Q : 18) Which of the following techniques belong to 'Project time plan'?

1. Critical path method

2. Precedence network analysis

3. Line of balance technique

4. Linear programme chart

A : 1, 2 and 3 only

B : 1, 2 and 4 only

C : 3 and 4 only

D : 1, 2, 3 and 4

Q : 19) Which one of the following techniques is not covered in project network analysis?

A : Critical path method

B : Program evaluation and review techniques

C : Procedure network analysis

D : Measurement book

Q : 20) In an activity-on-arrow network, which of the following rules of network logic are mandatory?

1. Any two events can be directly connected by not more than one activity.

2. Event numbers should not be duplicated in a network.

3. Before activity may begin, all the activities preceding it must be completed.

Select the correct answer using the code given below.

A : 1 and 2 only
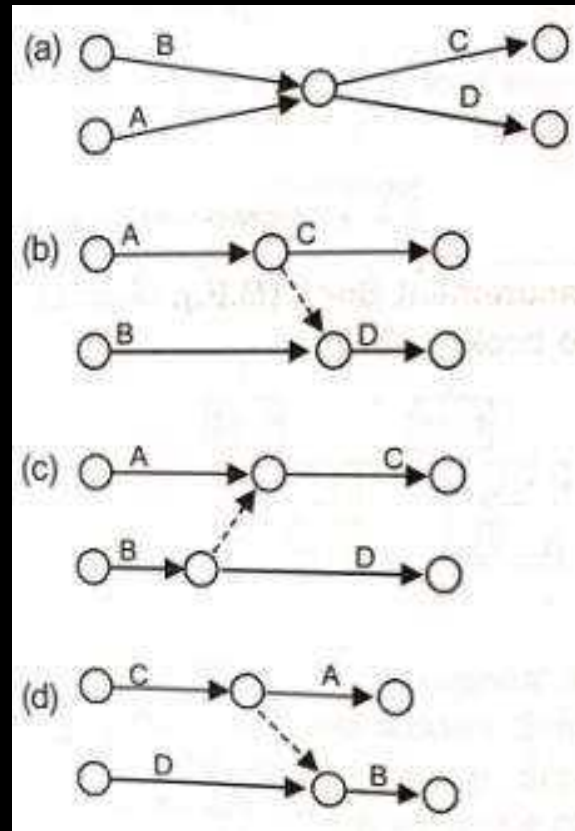
B : 2 and 3 only

C : 1 and 3 only

D : 1, 2 and 3

Q : 21) Statement (I) : A dummy job takes zero time to perform.

Statement (II) : It is used solely to illustrate precedence relationship.

Q : 22) Activity 'C' follows activity 'A' and activity 'D' follows activities 'A' and 'B'. The correct network for the projects is

Q : 23) Consider the following features/factors:

1. Projects are of the non-repetitive type

2. Time required need not be known

3. Time required is known precisely

4. Events have been established for planning

5. Emphasis is given to activities of project.

PERT is preferred for planning because of

A : 1, 2 and 4

B : 3, 4 and 5

C : 1, 3 and 4

D : 1, 2 and 5

Q : 24) For a given activity, the optimistic time, pessimistic time and the most probable estimates are 5, 17 and 8 days respectively. The expected time is

A : 8 days

B : 9 days

C : 10 days

D : 15 days

Q : 25) The probability distribution taken to represent the completion time in PERT analysis is
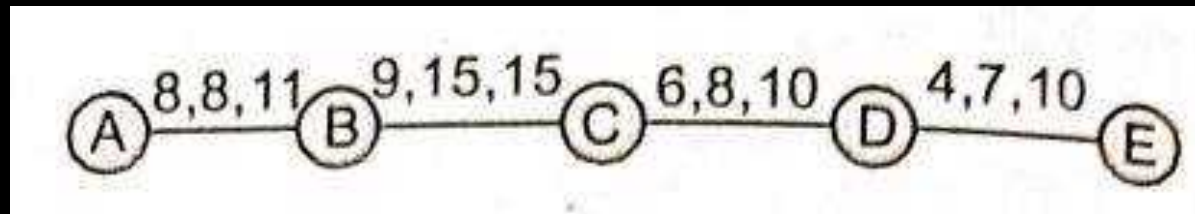
A : Gamma distribution

B : Normal distribution

C : Beta distribution

D : Log-normal distribution

Q : 26) The line of a PERT network is shown above in the diagram with a, m, b durations. What is the probable range of the total duration?

A : 34.2 to 47.2

B : 34.2 to 44.2

C : 32.6 to 44.2

D : 32.6 to 42.4

Q : 27) A, B, C, D and E are the 5 activities along the unique critical path of a AOA network of activities.

Their characteristics are as under

Activity	A	B	C	D	E
Expected duration (days)	7	6	11	14	5
Standard deviation (days)	2	2	3	4	1

What is the possible range of project duration (in days?)

A : 31.2 to 54.8   B : 28.1 to 57.9

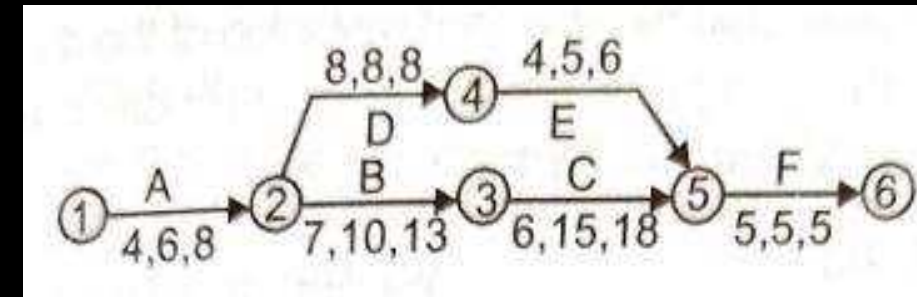C : 25.5 to 60.5   D : 24.6 to 61.4

Q : 28) What is the proportional variation, and what is the 'range' of project duration : the network as shown with the indicated probabilistic a, m, b durations of the respective activities?

A : 1/15, 28 to 42

B : 1/15, 30 to 45

C : 1/12, 28 to 42

D : 1/12, 30 to 45

Q : 29) Consider the following statements:

1. PERT is activity-oriented and adopts deterministic approach.

2. CPM is event-oriented and adopts probabilistic approach.

3. PERT is event-oriented and adopts probabilistic approach.

Which of these statements is/are correct?

A : 1 only

B : 1 and 2

C : 2 and 3

D : 3 only

Q : 30) It is estimated that an activity can be assigned an optimistic duration of 16 days, a pessimistic duration of 28 days and a must likely duration of 19 days. What is the expected duration for this activity?

A : 20 days

B : 19 days

C : 22 days

D : 18 days

Q : 31) Slack time in PERT analysis

A : Can never be greater than zero

B : Is always zero for critical activities

C : Can never be less than zero

D : Is minimum for critical events

Q : 32) Consider the following for durability of well-graded concrete:

1. The environment

2. Cover to embedded reinforcement

3. Shape and size of concrete member

Which of these are correct?

A : 1 and 2 only

B : 1 and 3 only

C : 2 and 3 only

D : 1, 2 and 3

Q : 33) Consider the following constituents of a high performance concrete (HPC):

1. Cement

2. Fine aggregate

3. Coarse aggregate

4. Water

5. Mineral admixture

6. Chemical admixture

Which of these constituents are relevant for HPC?

A : 1, 2, 3, 4, 5 & 6

B : 1, 2, 3, 4 & 5 only

C : 2, 3, 4, 5, & 6 only

D : 1, 2, 3, 4, & 6 only

Q : 34) The workability of concrete is assessed through:

1. Slump test

2. Compaction factor test

3. Setting time of cement

4. Le-chatelier's apparatus

A : 1 and 2

B : 2 and 3

C : 3 and 4

D : 4 and 1

Q : 35) Consider the following statements as describing the rheological behavious of fresh concrete:

1. Newtonian

2. Non-Newtonian

3. Ratio of shear stress to shear rate is constant

4. Ratio of shear stress to shear rate depends upon the shear rate

Which of these statements are correct?

A : 1, 2, 3 and 4   B : 2 and 4 only

C : 1, 2 and 4 only   D : 2, 3 and 4 only

Q : 36) What is the amount of water required for a workable RC of mix 1 : 2 : 4 by weight, when W/C is 0.6 and unit weight of concrete is 2400 kg/m³?

A : 165 l

B : 205 l

C : 245 l

D : 285 l

Q : 37) The carbonation process is demonstrated more by

A : Atmospheric corrosion

B : Chloride corrosion

C : Stress corrosion

D : Hydrogen embrittlement

Q : 38) Which of the following are relatable to autoclaved aerated concrete?

1. Light weight

2. Strong

3. Inorganic

4. Nontoxic

A : 1, 2 and 3 only

B : 1, 2 and 4 only

C : 3 and 4 only

D : 1, 2, 3 and 4

Q : 39) The workability of concrete becomes more reliable depending on

1. Aggregate-cement ratio

2. Time of transit

3. Grading of the aggregate

A : 1 only

B : 2 only

C : 3 only

D : 1, 2 and 3

Q : 40) Consider the following particulars in respect of a concrete mix design:

	Weight	Specific gravity
Cement	400 kg/m³	3.2
Fine aggregates	-	2.5
Coarse aggregates	1040 kg/m³	2.6
Water	200 kg/m³	1.0

What shall be the weight of the fine aggregates?

A : 520 kg/m³

B : 570 kg/m³

C : 690 kg/m³

D : 1000 kg/m³

Q : 41) Consider the following statements regarding cyclopean concrete:

1. Size of aggregate is more than 150 mm.

2. Size of aggregate is less than 150 mm.

3. High slump.

4. High temperature rise due to heat of hydration.

Which of the above statements are correct?

A : 1 and 3 only

B : 1 and 4 only

C : 2 and 3 only

D : 2 and 4 only

Q : 42) Given that for an element in a body of homogeneous isotropic material subjected to plane stress; $\varepsilon_x, \varepsilon_y$ and ε_z are normal strains in x, y, directions respectively and μ is the poisson's ratio, the magnitude of unit volume change of the element is given by

A : $\varepsilon_x + \varepsilon_y + \varepsilon_z$

B : $\varepsilon_x - \mu(\varepsilon_y + \varepsilon_z)$

C : $\mu\,(\varepsilon_x + \varepsilon_y + \varepsilon_z)$

D : $1/\varepsilon_x + 1/\varepsilon_y + 1/\varepsilon_z$

Q : 43) In terms of bulk modulus (K) and modulus of rigidity (G), the poisson's ratio can be expressed as

A : (3K – 4G)/(6K + 4G)

B : (3K + 4G)/(6K – 4G)

C : (3K – 2G)/(6K + 2G)

D : (3K + 2G)/(6K – 4G)

Q : 44) If all dimensions of prismatic bar of square cross-section suspended freely from the ceiling of roof are doubled then the total elongation produced by its own weight will increase
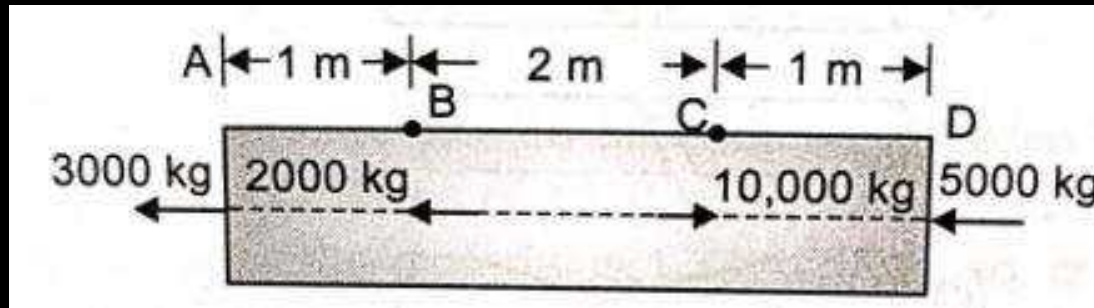
A : Eight times

B : Four times

C : Three times

D : Two times

Q : 45) A prismatic bar of uniform cross-sectional area of 5 cm² is subjected to axial loads as shown in the given figure.

Portion BC is subjected to an axial stress of

A : 400 kg/cm² tension

B : 2000 kg/cm² compression

C : 1000 kg/cm² tension

D : 600 kg/cm² tension

Q : 46) Match List-I with List-II and select the correct answer:

List-I	List-II
A. Tenacity B. Plasticity C. Ductility D. Malleability	1. Continues to deform without much increase of stress 2. Ultimate strength in tension 3. Extension in a direction without rupture 4. Ability to be drawn out by tension to a small section without rupture

Codes:

A : 2, 1, 4, 3

B : 2, 1, 3, 4

C : 1, 2, 4, 3

D : 1, 2, 3, 4

Q : 47) The material in which large deformation is possible before the absolute failure or rupture is termed as

A : Brittle

B : Elastic

C : Ductile

D : Plastic

Q : 48) If the Young's modulus 'E; is equal to bulk modulus 'K', then what is the value of the Poisson's ratio?

A : 1/4

B : 1/2

C : 1/3

D : 3/4

Q : 49) A steel rod, 100 mm long is held between two rigid supports. It is heated by 20°C. If the coefficient of thermal expansion of the material of the rod is 15×10^{-6}/°C and modulus of elasticity is 200×10^3 Mn/m², what is the stress in the rod?

A : 20 MN/m²

B : 40 MN/m²

C : 60 MN/m²

D : 80 MN/m²

Q : 50) A circular rod of diameter 30 mm and length 200 mm is subjected to a tensile force. The extension is rod is 0.09 mm and change in diameter is 0.0045 mm. What is the Poisson's ratio of the material of the rod?

A : 0.30

B : 0.32

C : 0.33

D : 0.35

Q : 51) For a material having modulus of elasticity equal to 208 GPa and Poisson's ratio equal to 0.3, what is the modulus of rigidity?

A : 74.0 GPa

B : 80.0 GPa

C : 100.0 GPa

D : 128.5 GPa

Q : 52) Given E as the Young's modulus of elasticity of a material, what can be the minimum value of its bulk modulus of elasticity?

A : E/2

B : E/3

C : E/4

D : E/5

Q : 53) Consider the following salient points in a stress-strain curve of a mild steel bar:

1. Yield point

2. Braking point

3. Yield plateau

4. Proportionality limit

5. Ultimate point

The correct sequence in which they occur while testing the mild steel bar in tension from initial zero strain to failure is

A : 4, 1, 2, 3 and 5   B : 1, 4, 3, 5 and 2

C : 4, 1, 3, 5 and 2   D : 1, 4, 2, 3 and 5

Q : 54) Two circular mild steel bars A and B of equal length l have diameters d_A = 2 cm and d_B = 3cm. Each is subjected to a tensile load of magnitude P. The ratio of the elongations of the bars l_A/l_B is

A : 2/3

B : 3/4

C : 4/9

D : 9/4

Q : 55) A metal bar of 10 mm diameter when subjected to a pull of 23.5 kN gave an elongation of 0.3 mm on a gauge length of 200 mm. The young's modulus of elasticity of the metal will nearly be
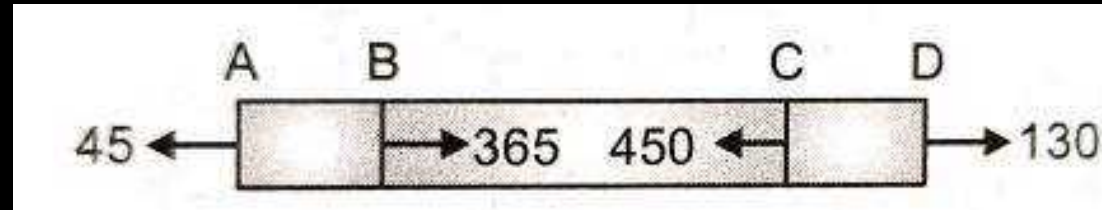
A : 200 kN/mm²

B : 300 kN/mm²

C : 360 kN/mm²

D : 400 kN/mm²

Q : 56) A member ABCD is subjected to a force system as shown in the figure

A   B   C   D

45 ←   → 365   450 ←   → 130

The resistive force in the part BC is

A : 365 (compressive)

B : 450 (tensile)

C : 85 (compressive)

D : 320 (compressive)

Q : 57) The symmetry of the stress tensor at a point in a body when at equilibrium is obtained from

A : Conservation of mass

B : Force equilibrium equations

C : Moment equilibrium equations

D : Conservation of energy

Q : 58) Consider the following statements:

1. In the infinitesimal strain theory, dilatation is taken as an invariant.

2. Dilatation is not proportional to the algebraic sum of all normal stresses

3. The shearing modulus is always less than the elastic modulus.

Which of the above statements is/are correct?

A : 1 only

B : 1 and 2 only

C : 2 only

D : 1, 2 and 3

Q : 59) The stress-strain curve for an ideally plastic material is
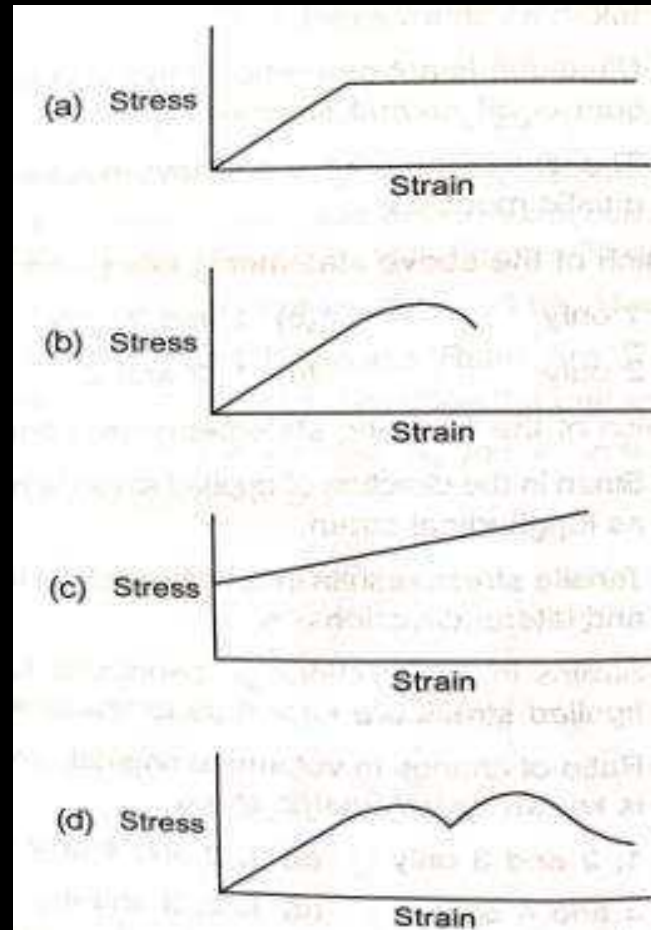
Q : 60) The total elongation of the structural element (fixed at one end, free at the other end, and of varying cross-section) as shown in the figure, when subjected to load 2P at the free end is

A : $6.66\dfrac{Pl}{AE}$

B : $5.55\dfrac{Pl}{AE}$

C : $4.44\dfrac{Pl}{AE}$

D : $3.33\dfrac{Pl}{AE}$
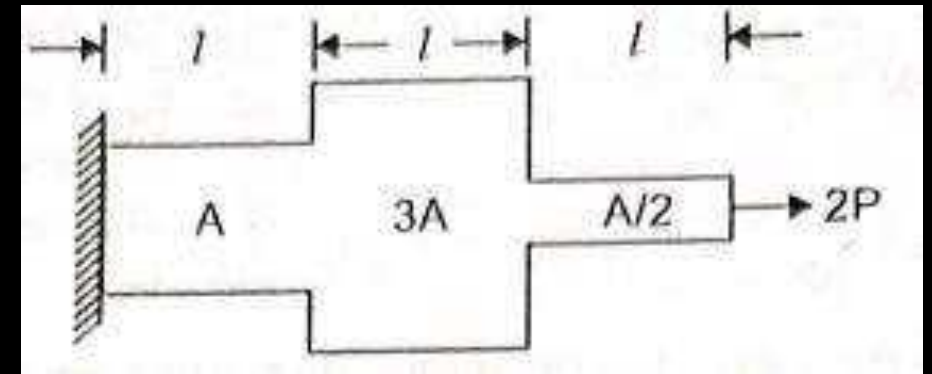
Q : 61) A chain, working a crane, has sectional area of 625 mm² and transmits a load of 10 kN. When the load is being lowered at a uniform rate of 40 m/min, the chain gets jammed suddenly at which time the length of the chain unwound is 10m. Assuming E = 200 GPa, the stress induced in the chain due to this sudden jamming is

A : 100.6 N/mm²

B : 120.4 N/mm²

C : 140.2 N/mm²

D : 160.0 N/mm²

Q : 62) In mild steel specimens subjected to tensile test cycle, the elastic limit in tension is raised and the elastic limit in compression is lowered, this is called

A : Annealing effect

B : Bauschinger effect

C : Strain rate effect

D : Fatigue effect

Q : 63) A bar specimen of 36 mm diameter is subjected to a pull of 90 kN during a tension test. The extension on a gauge length of 200 mm is measured to be 0.089 mm and the change in diameter to be 0.0046 mm. The poisson's ratio will be

A : 0.287

B : 0.265

C : 0.253

D : 0.241

Q : 64) A bar of uniform rectangular section of area A is subjected to an axial tensile load P; its young's modulus is E and its Poisson's ratio is $\frac{1}{m}$. Its volumetric strain, $\in_v$ is

A : $\frac{P}{AE}\left(1 + \frac{3}{m}\right)$

B : $\frac{P}{AE}\left(1 + \frac{2}{m}\right)$

C : $\frac{P}{AE}\left(1 - \frac{2}{m}\right)$

D : $\frac{P}{AE}\left(1 - \frac{1}{2m}\right)$

Q : 65) A steel bar 2 m long, 20 mm wide and 15 mm thick is subjected to a tensile load of 30 kN. If Poisson's ratio is 0.25 and Young's modulus is 200 GPa, an increase in Volume will be

A : 160 mm³

B : 150 mm³

C : 140 mm³

D : 130 mm³

Q : 66) A tie bar 50 mm × 8 mm is to carry a load of 80 kN. A specimen of same quality steel of cross sectional area is 250 mm². If the maximum load carried by the specimen is 125 kN, the gauge length will be

A : 133 mm

B : 126 mm

C : 113 mm

D : 106 mm