

SEAL

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Question Booklet No.

100308

2019

D

LECTURER CIVIL ENGINEERING

Time : 2 Hours

Maximum Marks : 125

ROLL NO.

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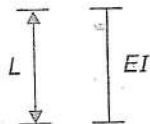
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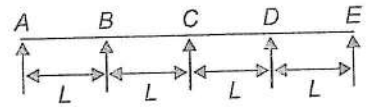
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- The moment distribution method in structural analysis can be treated as
 - force method
 - displacement method
 - flexibility method
 - an approximate method
- A uniformly distributed load of length shorter than the span crosses a girder. The bending moment at a section in girder will be maximum when
 - head of the load is at the section
 - tail of the load is at the section
 - section divides the load in the same ratio as it divides the span
 - section divides the load in two equal lengths
- Euler critical load of a column restrained against rotation and translation of both ends is

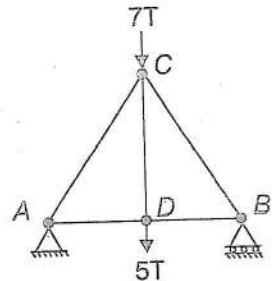


- EI/L^2
- $-EI/L^2$
- $1.33\pi^2 EI/L^2$
- $2.02\pi^2 EI/L^2$

- For maximum negative bending moment at support B of continuous beam $ABCDE$ the live load should be placed in the spans



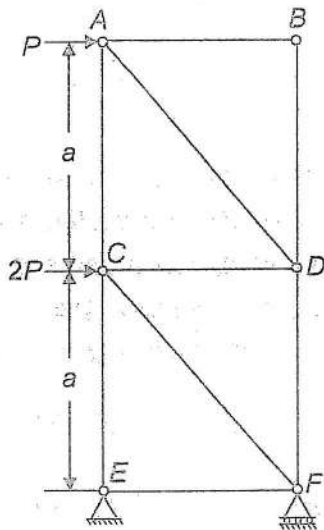
- AB and CD
 - AB, BC and DE
 - BC and DE
 - AB, BC, CD and DE
- What is the force in the vertical member CD of the pin-jointed frame shown below?



- $12T$ (tension)
 - $2T$ (compression)
 - $7T$ (compression)
 - $5T$ (tension)
- What is the area of influence line diagram for the reaction at the hinged end of a uniform propped cantilever beam of span L ?

| | |
|-----------|------------|
| (A) $L/8$ | (B) $L/2$ |
| (C) $L/4$ | (D) $3L/8$ |

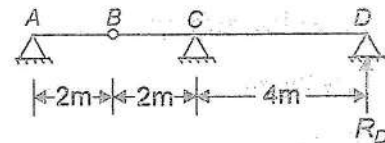
7. The force in the member CD of the truss shown in figure is



- (A) zero
 (B) $2P$ (compression)
 (C) P (compressive)
 (D) P (tensile)
8. A fixed beam AB of span L carries a uniformly distributed load w per unit length. During loading, the support B sinks downwards by an amount δ . If $\delta = \frac{wL^4}{72EI}$, what is the fixing moment at B ?
- (A) $\frac{wL^2}{12}$ (B) $\frac{wL^2}{6}$
 (C) $\frac{6EI\delta}{L^2}$ (D) Zero

9. The number of simultaneous equation to be solved in the slope deflection method is equal to
- (A) the degree of static indeterminacy
 (B) the degree of kinematics indeterminacy
 (C) the number of joints in the structure
 (D) the number of spans in the structure

10. What is the ordinate of influence line at B for reaction R_D in the figure below?



- (A) 0.5 (B) 0.4
 (C) 0.2 (D) Zero
11. System A is simply supported beam with a load P at midspan. System B is the same beam, but the load is replaced by uniformly distributed load of intensity P/L , wherein L is the span. The midspan deflection of system B will
- (A) be the same as that of system A at midspan
 (B) be less than that of system A at midspan
 (C) be more than that of system A at midspan
 (D) bear no relation to that of system

12. A cantilever beam A with rectangular cross-section is subjected to a concentrated load at its free end. If the width and depth of another cantilever beam B are twice those of beam A , then the deflection at free end of the beam B to that of A will be
- (A) 6.25% (B) 14%
(C) 23.6% (D) 28%
13. When the strain in a material increases with time under sustained constant stress, the phenomenon is known as
- (A) strain hardening
(B) hysteresis
(C) creep
(D) visco-elasticity
14. In a plane truss, if M is the number of members, R is the number of reactions and J is the number of joints, then for this truss to be determinate
- (A) $J = M + R$ (B) $J = 2M + R$
(C) $3J = M + 2R$ (D) $2J = M + R$
15. If two springs of stiffness k_1 and k_2 are connected in series, the stiffness of combined spring is
- (A) $k_1 k_2 / (k_1 + k_2)$
(B) $(k_1 + k_2) / k_1 k_2$
(C) $k_1 + k_2$
(D) $k_1 k_2$
16. The truss can be analysed by the methods of joints when the number of unknowns at joint is equal to
- (A) 1 (B) 2
(C) 3 (D) 4
17. A beam simply supported at both the ends, of length l carries two equal unlike couples M at two ends. If the flexural rigidity $EI = \text{constant}$, then the central deflection of beam is given by
- (A) $MI^2 / 4EI$ (B) $MI^2 / 16EI$
(C) $MI^2 / 64EI$ (D) $MI^2 / 8EI$
18. The degree of saturation in soils can be defined as the ratio of
- (A) water by weight to the dry soil weight
(B) volume of water to the gross volume of soil
(C) volume of water to volume of voids in soil
(D) weight of water to weight of soil
19. A soil has a liquid limit of 60%, plastic limit of 35% and shrinkage limit of 20% and it has a natural moisture content of 50%. The liquidity index of soil is
- (A) 1.5 (B) 1.25
(C) 0.6 (D) 0.4

20. The effective stress friction angle of a saturated cohesionless soil is 38° . The ratio of shear stress to normal effective stress on the failure plane is
- (A) 0.781 (B) 0.616
(C) 0.488 (D) 0.438
21. For determination of shear strength parameters, c and ϕ , of soil in the laboratory the test to be conducted will be
- (A) triaxial compression test
(B) sieve analysis
(C) compaction test
(D) relative density test
22. Quicksand is
- (A) one that loses moisture rapidly
(B) a type of pure silica sand
(C) a condition wherein a cohesionless soil loses its strength because of upward flow of water
(D) a sand consisting of spherical sand particles only
23. The porosity of a certain soil sample was found to be 80% and its specific gravity was 2.7; the critical hydraulic gradient will be estimated as
- (A) 0.34 (B) 0.92
(C) 1.0 (D) 1.5
24. Which of the following equations defines Darcy's law?
- (A) $q = KA$ (B) $q = K / A$
(C) $q = Ki A$ (D) $q = Ki / A$
25. If instead of single drainage, the number of drainage faces is increased to two in responding soils, the rate of compression will be
- (A) 4 times slower
(B) 2 times slower
(C) 4 times faster
(D) 2 times faster
26. Settlement due to creep in soils is dependent on
- (A) primary consolidation
(B) secondary consolidation
(C) initial settlement
(D) compaction settlement
27. A soil having particles of nearly the same size is known as
- (A) well graded
(B) uniformly graded
(C) poorly graded
(D) gap graded
28. A foundation is considered as shallow if its depth is
- (A) less than 1 meter
(B) greater than its width
(C) equal to or less than its width
(D) greater than 1 meter

29. For piping phenomenon to occur in soils, the most important condition to be satisfied is that the

- (A) specific gravity of soil solids is more than 2.8
- (B) void ratio is more than 2.0
- (C) hydraulic gradient is nearly unity
- (D) soil is fine grained

30. Which of the following parameters can be used to estimate the angle of internal friction of sandy soil?

- (A) Particle size
- (B) Roughness of particle
- (C) Particle size distribution
- (D) Density index

31. During seepage through an earth mass, the direction of seepage is

- (A) parallel to the equipotential lines
- (B) perpendicular to the streamlines
- (C) perpendicular to the equipotential lines
- (D) along the direction of gravity

32. In a compaction test on a soil sample, if the compaction energy is decreased then (γ_d = maximum dry density, OMC = optimum moisture content)

- (A) γ_d will increase with increase in OMC
- (B) γ_d will decrease with increase in OMC
- (C) γ_d will decrease with decrease in OMC
- (D) γ_d will increase with decrease in OMC

33. The time t required for attaining a certain degree of consolidation of a clay layer is proportional to

- (A) H^2 and C_v
- (B) H^2 and $\frac{1}{C_v}$
- (C) $\frac{1}{H^2}$ and C_v
- (D) $\frac{1}{H^2}$ and $\frac{1}{C_v}$

34. The point through which the resultant hydrostatic force acts is called

- (A) metacentre
- (B) centre of pressure
- (C) centre of buoyancy
- (D) centre of gravity

35. Mercury is generally used in manometers for measuring

- (A) low pressure accurately
- (B) large pressure only
- (C) all pressures except the smaller ones
- (D) very low pressure

36. A circular plate 1 m in diameter is submerged vertically in water such that its upper edge is 8 m below the free surface of water. The total hydrostatic pressure force on one side of plate is:

- (A) 6.7 kN
- (B) 65.4 kN
- (C) 45.0 kN
- (D) 77.0 kN

37. A container carrying water is moved in a horizontal direction with an acceleration of 2.45 m/s^2 . The angle of inclination of free water surface to the horizontal is
 (A) 14.03° (B) 67.8°
 (C) 45.00° (D) 0°
38. When a static liquid is subjected to uniform rotation in a container, the free surface assumes a shape of
 (A) a cone
 (B) a circular cylinder
 (C) a paraboloid of revolution
 (D) an ellipsoid of revolution
39. Fluid masses subjected to uniform acceleration are analysed using
 (A) the Newton's law of viscosity
 (B) the Newton's second law of motion
 (C) the Bernoulli's equation
 (D) the momentum equation
40. Centre of buoyancy is
 (A) the point through which the submerged weight of the body acts
 (B) the point through which the buoyant force acts
 (C) the point through which the resultant hydrostatic force acts
 (D) the centre of gravity of the liquid displaced by the body
41. Absolute pressure in a flow system
 (A) is always above local atmospheric pressure
 (B) is a vacuum pressure
 (C) may be above, below or equal to the local atmospheric pressure
 (D) is also called negative pressure
42. The relationship $\frac{dp}{dx} = \frac{dz}{dy}$ is valid for
 (A) irrotational flow
 (B) non-uniform flow
 (C) uniform flow
 (D) unsteady flow
43. If for a fluid in motion, pressure at a point is same in all directions, then the fluid is
 (A) a real fluid
 (B) a Newtonian fluid
 (C) an ideal fluid
 (D) a non-Newtonian fluid
44. A flow in which the velocities of liquid particles at all sections of pipe or channel are equal, is called as
 (A) uniform flow
 (B) laminar flow
 (C) turbulent flow
 (D) unsteady flow
45. For a perfect incompressible liquid, flowing in a continuous stream, the total energy of a particle remains the same, while the particle moves from one point to another. This statement is called
 (A) continuity equation
 (B) Bernoulli's equation
 (C) Pascal's law
 (D) Archimedes principle
46. Bernoulli's theorem deals with the principle of conservation of
 (A) energy (B) momentum
 (C) mass (D) force

47. The discharge over a triangular notch depends on the central angle of the notch, head over the notch, acceleration due to gravity and kinematic viscosity of the fluid. The number of non-dimensional terms formed for this phenomenon is
- (A) 1 (B) 3
(C) 2 (D) 4
48. At a section in channel expansion, the velocity over one-fifth section is zero and uniform over the remaining four-fifth section. The kinetic energy correction factor will be
- (A) 2.0 (B) 1.95
(C) 1.56 (D) 1.18
49. For a turbulent flow, the Reynolds number should be more than
- (A) 4000 (B) 2700
(C) 2000 (D) 500
50. Froude number is the ratio of inertia force to
- (A) pressure force
(B) viscous force
(C) gravity force
(D) elastic force
51. The Euler's number is the square root of the ratio between the inertia force and the
- (A) viscous force
(B) pressure force
(C) elastic force
(D) surface tension force
52. The total energy line lies over the hydraulic gradient line by an amount equal to
- (A) velocity head
(B) pressure head
(C) friction head
(D) datum head
53. An oil of viscosity 9 poise is flowing through a horizontal pipe of 60 mm diameter. If the flow is laminar, the pressure drop in 100 m length of the pipe is 1800 kN/m^2 . The average velocity of flow of oil is
- (A) 2.25 m/s
(B) 0.55 m/s
(C) 5.5 m/s
(D) 22.5 m/s
54. A flow through long pipe at constant rate is called
- (A) steady uniform flow
(B) steady non-uniform flow
(C) unsteady uniform flow
(D) unsteady non-uniform flow
55. Two tanks connected in parallel by two pipes A and B of identical friction factors and lengths. If the size of pipe A is double than that of pipe B, then their discharges will be in the ratio of
- (A) 2 (B) 4
(C) 5.66 (D) 32

56. If the velocity of flow as well as the diameter of the flowing pipe are respectively doubled through pipe system in use since long, the head loss will thereafter be
 (A) halved
 (B) doubled
 (C) increased 4 times
 (D) No change
57. A shock wave which occurs in a supersonic flow represents a region in which
 (A) a zone of silence exists
 (B) there is no change in pressure, temperature and density
 (C) there is sudden change in pressure, temperature and density
 (D) velocity is zero
58. A change in the state of a system at constant volume is called
 (A) isobaric process
 (B) isochoric process
 (C) isothermal process
 (D) adiabatic process
59. The sonic velocity is largest in which of the following?
 (A) Water (B) Steel
 (C) Kerosene (D) Air
60. An isentropic flow is one which is
 (A) isothermal
 (B) adiabatic
 (C) adiabatic and irreversible
 (D) adiabatic and reversible
61. Indicate up to what Mach number a fluid flow can be considered incompressible.
 (A) 0.1 (B) 0.3
 (C) 0.8 (D) 1.0
62. The region outside the Mach cone is called
 (A) zone of action
 (B) zone of silence
 (C) control volume
 (D) control area
63. A convergent-divergent nozzle is used when the discharge pressure is
 (A) less than the critical pressure
 (B) equal to the critical pressure
 (C) more than the critical pressure
 (D) at normal pressure
64. At critical pressure ratio, the velocity at the throat of a nozzle is
 (A) equal to the sonic speed
 (B) less than the sonic speed
 (C) more than the sonic speed
 (D) equal to the subsonic speed
65. A shock wave is produced when
 (A) a subsonic flow changes to sonic flow
 (B) a sonic flow changes to supersonic flow
 (C) a supersonic flow changes to subsonic flow
 (D) there is a sonic flow

66. The sonic velocity in a fluid medium is directly proportional to
- Mach number
 - pressure
 - square root of temperature
 - square root of pressure
67. Across a normal shock
- the entropy remains constant
 - the pressure and temperature rise
 - the velocity and pressure decrease
 - the density and temperature decrease
68. A normal shock wave
- is reversible
 - is irreversible
 - is isentropic
 - occurs when approaching flow is supersonic
69. In a supersonic flow, a diffuser is a conduit having
- gradually decreasing area
 - converging-diverging passage
 - constant area throughout its length
 - gradually increasing area
70. A process during which no heat is transferred to or from the gas is called an
- isochoric process
 - isobaric process
 - adiabatic process
 - isothermal process
71. The phenomenon occurring in an open channel when a rapidly flowing stream abruptly changes to slowly flowing stream causing a distinct rise of liquid surface, is
- water hammer
 - hydraulic jump
 - critical discharge
 - normal flow
72. For a given discharge in horizontal frictionless channel two depths may have the same specific force. These two depths are known as
- specific depths
 - sequent depths
 - alternate depths
 - normal depth and critical depth
73. Shooting flow can never occur
- directly after a hydraulic jump
 - in a horizontal channel
 - in a mild slope channel
 - in a steep slope channel
74. Development of surges in the open channel is
- gradually varied flow
 - rapidly varied flow
 - steady flow
 - normal flow
75. The velocity distribution in turbulent flow is a function of the distance y measured from the boundary surface and the friction velocity u , and follows a
- parabolic law
 - logarithmic law
 - hyperbolic law
 - linear law

76. The drag force experienced by an object is
- the horizontal component of the resultant fluid dynamic force acting on the object
 - the horizontal force due to pressure variation over the surface of object
 - the component of resultant fluid dynamic force in the flow direction
 - the resultant fluid dynamic force acting on the object
77. The pressure drag depends upon
- the shear stresses generated on the body surface
 - the boundary layer formation
 - the separation of boundary layer and the size of wake
 - the characteristics of the oncoming flow
78. The boundary layer flow over a sufficiently large flat plate is
- laminar throughout the entire length
 - turbulent throughout
 - laminar over a short initial length and therefore turns turbulent
 - in transition from laminar to turbulent
79. In case of airfoils, the profile drag is one which is caused by
- end effects due to finite length of airfoil
 - the shape and orientation of airfoil
 - the circulation induced around the airfoil
 - the compressibility effects
80. A streamlined body is defined as a body about which
- the flow is laminar
 - the flow is along streamlines
 - the flow separation is suppressed
 - the drag is zero
81. Water hammer is a phenomenon which is caused by
- sudden opening of a valve in a pipeline
 - sudden closure (partial or complete) of a valve in pipeflow
 - incompressibility of fluid
 - the pipe material being elastic
82. The closure of water valve is considered rapid when
- the valve is closed almost instantaneously
 - the duration of valve closure is less than $2L/C$
 - the duration of valve closure is less than L/C
 - the duration of valve closure is greater than $2L/C$
83. The critical depth is the depth of flow at which
- the specific energy is maximum
 - the unit discharge is minimum
 - the specific energy is minimum
 - the Froude number is greater than unity

84. Alternate depths of flow in a channel are
- the depths at which the total energies are same
 - the depths which occur at the same specific energy
 - the depths for the same specific force
 - the conjugate depths
85. For flow over a broad crested weir to be critical, the height Z of the weir should satisfy the following relationship :
- $Z < (E_1 - E_{\min})$
 - $Z < (E_1 + E_{\min})$
 - $Z \geq (E_1 - E_{\min})$
 - $Z \geq (E_1 + E_{\min})$
86. The friction drag is primarily due to
- pressure distribution over the body surface
 - shear stresses generated due to viscous action
 - weight component in the direction of flow
 - separation of boundary layer
87. The survey in which the curvature of earth is ignored is called as
- plane survey
 - geodetic survey
 - geological survey
 - aerial survey
88. The position of a point can be fixed more accurately by
- perpendicular offset
 - optical square
 - prism square
 - oblique offsets
89. If n is the number of sides, then the total sum of interior angles of a closed traverse should be
- $n + 2$
 - $2n - 4$
 - $2n + 4$
 - $4n - 2$
90. The lines of force of earth's magnetic field are parallel to the earth's surface
- near to poles
 - at right angles to the poles
 - at 45° to the line joining poles
 - near the equator
91. The first temporary adjustment of a prismatic compass is
- levelling
 - focusing of the prism
 - removing the parallax
 - centering
92. In a plane table survey the plotting of inaccessible points can be conveniently done by
- method of interpolation
 - method of radiation
 - method of traversing
 - method of intersection

93. Levelling across a river is done by
 (A) fly levelling
 (B) reciprocal levelling
 (C) trigonometrical levelling
 (D) cross levelling
94. The contours which are parallel and equidistant on an area, then that area should be
 (A) flat (B) steep slope
 (C) gentle slope (D) uniform slope
95. Spire test is used in permanent adjustment of theodolite for
 (A) adjusting the plate levels
 (B) adjusting the line of sight
 (C) adjustment of the vertical axis
 (D) adjustment of horizontal axis
96. In the double application of principle of reversion used in the adjustment of vertical hairs, the apparent error is
 (A) half the true error
 (B) equal to true error
 (C) double the true error
 (D) four times the true error
97. The included angles of a traverse are generally measured
 (A) clockwise from back station
 (B) clockwise from forward station
 (C) anti-clockwise from back station
 (D) anti-clockwise from forward station
98. A curve of varying radius introduced between two branches of a compound curve is called
 (A) transition curve
 (B) mean curve
 (C) base curve
 (D) common curve
99. The Simpson's rule for determination of areas is used when the number of offsets is
 (A) 2 (B) 3
 (C) odd (D) even
100. The intersection of a vertical line through the observer's station with the upper portion of a celestial sphere, is known as
 (A) zenith (B) base
 (C) nadir (D) celestial horizon
101. The point where a vertical line through the optical centre of the camera lens intersects the ground, is known as
 (A) ground principal point
 (B) ground plumb point
 (C) iso-centre
 (D) perspective centre
102. A 30 m metric chain is found to be 0.1 m too short throughout the measurement. If the distance measured is recorded as 300 m, then the actual distance will be
 (A) 300.1 m (B) 301.0 m
 (C) 299.0 m (D) 310.0 m

103. The point, through which the whole weight of the body acts, irrespective of its position, is known as
- (A) centre of percussion
(B) moment of inertia
(C) centre of mass
(D) centre of gravity
104. The forces which meet at one point and have their lines of action in different planes are called
- (A) coplanar non-concurrent forces
(B) non-coplanar concurrent forces
(C) non-coplanar non-concurrent forces
(D) intersecting forces
105. If a body moves in such a way that its velocity increases by equal amount in equal intervals of time, it is said to be moving with
- (A) a uniform retardation
(B) a uniform acceleration
(C) a variable acceleration
(D) a variable retardation
106. If the tension in a cable supporting a lift moving upwards is twice the tension when the lift is moving downwards, the acceleration of the lift, is
- (A) $g/2$ (B) $g/3$
(C) $g/4$ (D) $g/5$
107. A bullet weighing 200 g is fired horizontally with a velocity of 25 m/sec from a gun carried on a carriage which together with the gun weighs 100 kg. The velocity of recoil of the gun, will be
- (A) 0.01 m/sec (B) 0.05 m/sec
(C) 1.00 m/sec (D) 1.5 m/sec
108. The section modulus of a rectangular light beam 25 metres long is 12.500 cm^3 . The beam is simply supported at its ends and carries a longitudinal axial tensile load of 10 tonnes in addition to a point load of 4 tonnes at the centre. The maximum stress in the bottom most fibre at the midspan section, is
- (A) 13.33 kg/cm^2 tensile
(B) 13.33 kg/cm^2 compressive
(C) 26.67 kg/cm^2 tensile
(D) 26.67 kg/cm^2 compressive
109. From a circular plate of a diameter 6 cm is cut out a circle whose diameter is equal to the radius of the plate. The CG of the remainder from the centre of circular plate is at a distance of
- (A) 2.0 cm (B) 1.5 cm
(C) 1.0 cm (D) 0.5 cm
110. A smooth cylinder lying on its convex surface remains
- (A) in stable equilibrium
(B) in unstable equilibrium
(C) in neutral equilibrium
(D) out of equilibrium

111. Modulus of rigidity is defined as the ratio of
- (A) longitudinal stress to longitudinal strain
 - (B) shear stress to shear strain
 - (C) stress to strain
 - (D) volumetric stress to volumetric strain
112. The point at which a specimen elongates by a considerable amount with any increase in load is
- (A) permanent set
 - (B) yield point
 - (C) ultimate stress
 - (D) final point
113. For which of the following materials, the Poisson's ratio is expected to be the least?
- (A) Steel
 - (B) Cast iron
 - (C) Concrete
 - (D) Copper
114. At the point of contraflexure
- (A) bending moment is minimum
 - (B) bending moment is maximum
 - (C) bending moment and shear force both are either zero or change sign
 - (D) bending moment is either zero or changes sign
115. The ratio of maximum deflection of a beam to its span is called
- (A) section modulus of the beam
 - (B) modulus rigidity of the beam
 - (C) stiffness of the beam
 - (D) bulk modulus of the beam
116. The determination of stresses on oblique sections of a strained material is an important step in the design of
- (A) framed structures
 - (B) riveted connections
 - (C) welded connections
 - (D) nut and bolt jointed connections
117. The intensity of circumferential stress is
- (A) equal to the longitudinal stress
 - (B) half of the longitudinal stress
 - (C) double the longitudinal stress
 - (D) triple the longitudinal stress
118. A rectangular beam 10 cm wide, is subjected to a maximum shear force of 50000 N, the corresponding maximum shear stress being 3 N/mm^2 . The depth of the beam is
- (A) 25 cm
 - (B) 22 cm
 - (C) 16.67 cm
 - (D) 30 cm

119. Castigliano's first theorem is applicable

- (A) for elastic structure
- (B) for all statically determinate structures
- (C) only when principle of superposition is valid
- (D) for all indeterminate structures

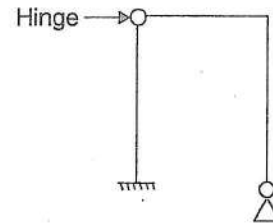
120. The Muller-Breslau principle in structural analysis is used for

- (A) drawing influence line diagram for any force function
- (B) superimposition of load effects
- (C) writing virtual work equation
- (D) drawing shear force diagram

121. When a load is applied to a structure with rigid joints

- (A) there is no rotation or displacement of joints
- (B) there is no rotation of joints
- (C) there is no displacement of joints
- (D) there can be rotation and displacement of joints but the angle between the members connected to the joints remains same even after application of load

122. The kinematic indeterminacy of the frame is



- (A) 4
- (B) 6
- (C) 8
- (D) 10

123. A suspension bridge with a two-hinged stiffening girder is

- (A) statically determinate
- (B) indeterminate of one degree
- (C) indeterminate of two degrees
- (D) a mechanism

124. The moment required to rotate the near end of a prismatic beam through unit angle without translation, when the far end is fixed, is

- (A) EI/L
- (B) $2EI/L$
- (C) $3EI/L$
- (D) $4EI/L$

125. The conjugate beam method falls in the category of

- (A) force method
- (B) stiffness method
- (C) displacement method
- (D) moment area method