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CIVIL ENGINEERING
BPSC PRACTICE QUESTIONS

01. The free-body diagram of a satellite rotating about the earth will show the satellite isolated from its surroundings and:
(a) no force acting on it
(B) its velocity shown on it
(C) the force of gravity and centrifugal force acting on it
(D) the force of gravity, centrifugal force and its velocity

02. The time taken by a small frictionless bead to slide on a thin wire in the gravitational field is the minimum if the shape of the wire is :
(A) A straight line (B) A cycloid (C) An involute (D) A parabola

03. Stability of equilibrium of a body requires that:
(A) $\frac{dPE}{ds} = 0$ (B) $\frac{dPE}{ds} = 0$ and $\frac{d^2PE}{ds^2} < 0$
(C) $\frac{dPE}{ds} = 0$ and $\frac{d^2PE}{ds^2} > 0$ (D) None of the above

04. A rigid body, in translation:
(A) Must undergo plane motion only (B) Cannot move on a circular path
(C) May move along a straight or curved path (D) Can only move in a straight line

05. The first moment of triangular area of base "b" and height "h" taken about an axis coincident with the base is given by:
(A) $\frac{bh^3}{12}$ (B) $\frac{b^2h}{6}$ (C) $\frac{bh^2}{6}$ (D) $\frac{h}{3}$

06. The second moment of a plane area about any axis as compared to its second moment about the neutral axis:
(A) is always more (B) is always less (C) is sometimes more (D) is equal

07. The coefficient of restitution is defined on the basis of :
    (A) Velocity components along the line of impact only
    (B) Velocity component normal to the line of impact
    (C) The velocity direction before and after the collision
    (D) None of the above

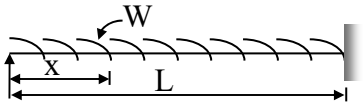
08. The acceleration of a particle is given by $a = t^3 - 3t^2 + 5$ m/s^2 where the time "t" is in seconds. If the velocity of the particle at t = 1 second is 6.25 m/s and displacement is 8.8 m, the velocity and displacement at t = 2 seconds is:
    (A) 8 m/sec, 16.1 m
    (B) 8.5 m/sec, 16.5 m
    (C) 9 m/sec, 16.1 m
    (D) 16.4 m/sec, 8 m

09. The D' Alembert principle:
    (A) is hypothetical principle
    (B) provides no special advantage over Newton's law
    (C) is based upon the existence of inertia forces
    (D) allows a dynamic problem to be treated as a statical problem

10. The Coriolis acceleration may not vanish:
    (A) If the relative velocity of the moving point become zero
    (B) if the rotational velocity of the moving frame become zero
    (C) if the rotational velocity of the moving frame and relative velocity become collinear
    (D) if the angular acceleration of the point become zero

11. The ratio of effective length of compression member of steel to the approximate radius of gyration shall not exceed:
    (A) 400 (B) 350 (C) 300 (D) 250

12. Beam fixed one end, supported at the other with uniform load as shown, then max deflection is given by:



    (A) $\Delta \simeq 185\frac{WL^4}{EI}$
    (B) $\Delta \simeq 180\frac{WL^2}{EI}$
    (C) $\Delta \simeq 185\frac{WL^3}{EI}$
    (D) $\Delta \simeq 180\frac{WL^4}{EI}$

13. Poisson's ratio is a constant upto elastic limit. It is the range of _____ for steel.
(A) $\frac{1}{4}$ to $\frac{1}{3}$ (B) $\frac{1}{5}$ to $\frac{1}{4}$ (C) $\frac{1}{5}$ to $\frac{1}{3}$ (D) $\frac{1}{6}$ to $\frac{1}{5}$

14. A beam of square cross section (B × B) is used as a beam with one diagonal horizontal. The location of the maximum shear stress from the neutral axis will be at a distance of:
(A) zero (B) $\frac{B}{4}$ (C) $\frac{0.25B}{\sqrt{2}}$ (D) $\frac{B}{8}$

15. The maximum stress produced in a bar of tapering section under direct tension is at:
(A) large end (B) smaller end (C) middle (D) anywhere

16. If a composite bar is cooled, then the nature of stress in the part with high coefficient of thermal expansion will be:
(A) Tensile (B) Zero (C) Compressive (D) None of these

17. When a cantilever is loaded at its free end by a downward load, maximum compressive stress shall develop at:
(A) bottom fiber (B) top fiber (C) neutral axis (D) centre of gravity

18. The stability of a dam is checked for:
(A) tension at the base (B) over turning of the dam
(C) sliding of the dam (D) all of these

19. The effective thickness of a fillet weld is
(A) $\frac{S}{2}$ (B) $\frac{S}{1.66}$ (C) $\frac{S}{1.428}$ (D) $\frac{S}{1.25}$
Where S is size of weld.

20. When a closely coiled spring is subjected to an axial load, it is said to be under:
(A) Bending only (B) Shear only
(C) Torsion and shear (D) None of these

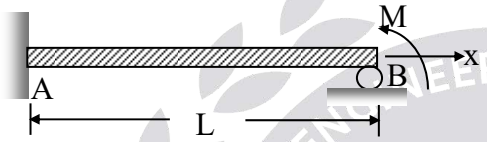
21. Polar moment of inertia of a solid shaft of diameter "D" is :
(A) $\frac{\pi D^3}{16}$ (B) $\frac{\pi D^2}{16}$ (C) $\frac{\pi D^2}{36}$ (D) $\frac{\pi D^4}{32}$

22. When a solid shaft is subjected to torsion, the shear stress induced in the shaft at its centre is
(A) Zero (B) Minimum (C) Maximum (D) Average

23. Stiffness factor of a beam fixed at one end and simply supported at the other end for rotation at simply supported end is:
(A) $\frac{3EI}{L}$ (B) $\frac{4EI}{L}$ (C) $\frac{6EI}{L}$ (D) $\frac{8EI}{L}$

24. Two simply supported beams of the same span carry the same total load. If the first beam carries the total load as a point load at its centre and the other uniformly distributed over the whole span, then the ratio of maximum slopes of first beam to the second will be:
(A) 1 : 1 (B) 1 : 15 (C) 1.5 : 1 (D) 2 : 1

25. The end rotation for the given beam is



(A) $0.25\frac{ML^2}{EI}$ (B) $0.25\frac{ML}{EI}$ (C) $0.2\frac{ML^3}{EI}$ (D) $0.35\frac{ML}{EI}$

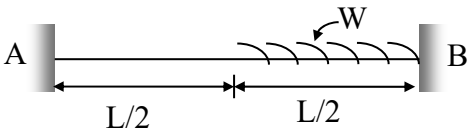
26. The total strain energy of truss element is 500 joules and it carries an axial force of 100 kN. The extension of the member is:
(A) 1 mm (B) 2 mm (C) 5 mm (D) 10 mm

27. Castigliano's theorem falls under the category of:
(A) Displacement method (B) Equilibrium method
(C) Force method (D) Stiffness method

28. A rod is stressed to 50 kN/mm^2 in tension. The E for the rod is 200 kN/mm^2. The strain energy per cubic meter will be:
(A) 6.25×10^9 (B) 5.0×10^9 (C) 2.5×10^9 (D) 1.25×10^9

29. The rotation of the free end of a cantilever beam due to a 5 kN load is 0.001 rad. Then the deflection of the free end due to a moment of 120 kN-m is :
(A) 1.2 mm (B) 2.4 mm (C) 3.6 mm (D) 4.8 mm

30. The fixed end moment M_{FAB} for the beam shown in the figure below is



(A) $\frac{10WL^2}{192}$ (B) $\frac{5WL}{48}$ (C) $\frac{11WL}{48}$ (D) $\frac{WL^2}{48}$

31. Moment distribution method is best suited for :
(A) Indeterminate pin jointed truss (B) Rigid frames
(C) Space frames (D) Trussed beam

32. The carry-over factor for a prismatic beam element with far end fixed is :
(A) 1 (B) 0.5 (C) 0.33 (D) 0.25

33. The column analogy method is applicable for the indeterminate structure having maximum redundancy equal to :
(A) 1 (B) 2 (C) 3 (D) No limitation

34. The number of unknowns to be determined in the stiffness method is equal to :
(A) Static indeterminancy (B) Kinematic indeterminancy
(C) Sum of static and kinematic indeterminancy (D) None of the above

35. Which of the following sections will have maximum shape factor ?
(A) Square (B) Circular (C) Diamond (D) Triangle

36. The shape of influence line diagram for the bending moment at mid span in a simply supported beam is :
(A) Rectangular (B) Triangular (C) Parabolic (D) Circular

37. The Muller-Breslau principle for influence line is applicable to :
(A) Simple beam (B) Continuous beam
(C) Redundant truss (D) All of the above

38. The variation of influence line for vertical support reaction of a statically determinate beam is :
(A) Linear (B) Parabolic
(C) Circular (D) None of the above

39. The area of the influence line diagram for the reaction at the hinged end of a uniform propped cantilever beam of span "L" is :
(A) $\frac{L}{2}$ (B) $\frac{3L}{8}$ (C) $\frac{L}{4}$ (D) $\frac{L}{8}$

40. The total area of the influence line diagram for shear force at mid span in a simply supported beam of span L is :
(A) $\frac{L^2}{8}$ (B) Zero (C) $\frac{L^2}{2}$ (D) $\frac{L}{2}$

41. A two–hinged parabolic arch is subjected to a temperature rise of t^{o}C, then the horizontal thrust at the support will :
(A) increase (B) decrease
(C) remain same (D) increase or decrease

42. The line of thrust in a Parabolic arch is :
(A) Funnicular Polygon (B) Parabolic
(C) Triangular (D) Circular

43. The simply supported bending moment at the central hinge of a three hinged arch is 36 kNm. The span and rise at the hinge are 12 m and 3 m respectively. The horizontal thrust in the arch is :
(A) 3 kN (B) 6 kN (C) 9 kN (D) 12 kN

44. In approximate analysis of building frames under lateral loads, the point of inflection in beams and columns is assumed at :
(A) Span / 2 (B) Span / 3 (C) Span /10 (D) Span / 20

45. The effective slenderness ratio of a cantilever column of length L :
(A) 0.5 L/r (B) L/r (C) $\sqrt{2}$ L/r (D) 2 L/r
Where, r = radius of gyration.

46. A 40 cm diameter circular timber column is 4 m long (effective). The slenderness ratio of the column is :

(A) 10 (B) 20 (C) 40 (D) 20 $\sqrt{2}$

47. A soil sample (sp. gr 2.7) has a degree of saturation of 40 % at water content of 20%. The void ratio of the sample is :

(A) 1.35 (B) 0.03 (C) 5.4 (D) None of these

48. Sieving is not carried out for grain sizes smaller than about :

(A) 0.75 mm (B) 0.075 mm (C) 0.150 mm (D) 0.20 mm

49. If sand is in its densest state, its relative density is :

(A) Zero (B) 1 (C) Less than 1 (D) Greater than 1

50. The ratio of the shear strength of undisturbed soil to that of remoulded soil is known as the :

(A) liquidity index (B) activity index (C) relative consistency (D) sensitivity

51. Talus is a soil transported by :

(A) Wind (B) Water (C) Glaciers (D) Glacial tills

52. Darcy's Law is applicable if a soil is :

(A) incompressible (B) homogeneous (C) isotropic (D) All of these

53. The hydrostatic pressure on a phreatic line equals :

(A) Atmospheric (B) Less than Atmospheric
(C) Greater than Atmospheric (D) None of these

54. Liquefaction can be prevented by :

(A) providing filters (B) increasing the seepage length of the flow
(C) lowering the water table (D) All of these

55. The horizontal Geostatic stress at a depth of 4m in a uniform deposit of soil having Kb = 0.5 and γ_b= 16.5 kN/m^{3}is :

(A) 16.0 kN/m^2 (B) 22.0 kN/m^2 (C) 33.0 kN/m^2 (D) 66.0 kN/m^2

where Kb is Boussinesq's influence factor.

56. The shear stress below a point load of 2 tons at a depth 4 m in a soil mass is :
(A) Zero (B) 2 t/m^2 (C) 1t/m^2 (D) None of these

57. If the coefficient of volume change and the coefficient of permeability of a soil mass are 2.91×10^{-4} m^2/kNand 3.4×10^{-5}m/sec then the coefficient of consolidation will be :
(A) 11.91×10^{-3} m^2/sec (B) 3.62×10^{-3} m^2/sec
(C) 9.82×10^{-4} m^2/sec (D) 9.89×10^{-9} m^2/sec

58. If instead of single drainage, the number of drainage faces are increased to two, the rate of compression will be :
(A) 4 times slower (B) 2 times slower
(C) 4 times faster (D) None of the above

59. After the complete consolidation of a soil mass, the effective stress becomes equal to :
(A) the pore water pressure (B) the neutral stress
(C) Both of these (D) None of these

60. Sheep foot roller is ideally suited for the compaction of :
(A) cohesive soils (B) cohensionless soils
(C) both types of soils (D) None of these

61. An unconfined compression test is good for :
(A) Granular soils (B) Saturated cohesive soils
(C) Both granular and cohesive soils (D) None of these

62. A deviatoric stress is given by :
(a) $\sigma_1 + \sigma_3$ (B) $\sigma_1 - \sigma_3$
(C) $\frac{\sigma_1 + \sigma_3}{2}$ (D) None of these

63. The maximum pressure intensity which a soil can carry without shear failure is known as its :
(A) safe bearing capacity (B) ultimate bearing capacity
(C) net safe bearing capacity (D) net ultimate bearing capacity

64. The bearing capacity factor for local shear failure, are determined with respect to :
(A) average c and ϕ parameters
(B) increased c and reduced ϕ parameters
(C) decreased c and increased ϕ parameters
(D) reduced c and ϕ parameters

65. The viscosity of the grout pumped into weak soil depends directly on the :
(A) specific gravity of the soil
(B) shear strength of the soil
(C) permeability of the soil
(D) degree of saturation of the soil

66. In a plate load test, the ultimate load is estimated from the load-settlement curve on a log-loggraph :
(A) Directly
(B) By drawing tangents to the curve at the initial and final points
(C) By the secant method
(D) Simply at 0.2% of the maximum settlement

67. Pile foundations are provided to :
(A) carry loads
(B) resist horizontal and uplift forces
(C) compact a loose cohesionless deposit
(D) All of these

68. The efficiency of pile group depends on :
(A) soil type
(B) method of pile installation
(C) pile spacing
(D) All of these

69. The method of slices was first suggested by :
(A) Taylor
(B) Bishop
(C) Fellineous
(D) Terzaghi

70. A slope is considered infinite when :
(A) its length in the third dimension is infinite
(B) the slant height is very large
(C) the base of embankment is very long
(D) All of these

71. To have zero active pressure intensity at the top of a wall in cohesive soil, one can apply a uniform surcharge of intensity :
(A) $2c \cot \alpha$
(B) $2c \tan \alpha$
(C) $-2c \cot \alpha$
(D) $-2c \tan \alpha$

72. An unsupported vertical cut may be made in cohesive soil to a height of :

(a) $\frac{2c}{\gamma}\tan\left[45+\frac{\phi}{2}\right]$ (B) $\frac{2qu}{\gamma}\tan\left[45+\frac{\phi}{2}\right]$

(C) $\frac{4qu}{\gamma}\tan\left[45-\frac{\phi}{2}\right]$ (D) $\frac{4c}{\gamma}\tan\left[45-\frac{\phi}{2}\right]$

73. The pressure diagram below the dredge line of an anchored sheet-pile wall embedded in cohesionless soil is :

(A) rectangular (B) triangular

(C) triangular then rectangular (D) parabolic

74. Dynamic Magnification factor is the ratio of :

(A) static force to dynamic force (B) dynamic force to static deflection

(C) dynamic deflection to static deflection (D) dynamic force to static force

75. The Westergaard equations are used for analysis of :

(A) clayey soils (B) sedimentary soils

(C) black cotton soils (D) cohesionless soils

76. Under reamed piles are normally :

(A) Precast piles (B) Bored piles

(C) Driven piles (D) Sunken piles

77. A lubricant 100 times more viscous than water would have a viscosity (in Pa-s) :

(A) 0.01 (B) 0.1 (C) 1 (D) 10

78. Kinematic Viscosity and specific gravity of a certain liquid are 5.58 stokes and 2 respectively. The viscosity of liquid in S.I. unit are :

(A) 1.116 Ns/m^2 (B) 1.315 Ns/m^2

(C) 1.489 Ns/m^2 (D) 1.652 Ns/m^2

79. In the laminar boundary layer flow over a flat plate, the ratio (δ/x) varies as :

(A) Re (B) $\sqrt{Re}$ (C) 1/Re (D) $Re^{-1/2}$

whereδ is the boundary layer thickness and X is the distance from the leading edge in the direction of flow.

80. The turbulence in which the products and squares of the velocity component and their derivatives are independent of direction is called :
(A) isotropic (B) potential (C) anisotropic (D) laminar

81. The laminar boundary layer thickness varies as :
(a) $x^{-1/2}$ (B) $x^{1/2}$ (C) $x^{1/7}$ (D) $x^{6/7}$

82. For psedoplastic fluid, flow consistency index is :
(A) < 1 (B) = 1 (C) > 1 (D) □∞

83. If the fluid entering the pipe is turbulent and the velocity in the tube is above critical the transition length is :
(A) 40 to 50 times the pipe diameter (B) 10 to 30 times the entering velocity
(C) 20 to 30 times the pipe diameter (D) None of the above

84. If the pressure on the surface of an oil (s.g = 0.8) tank is 0.1 kg/cm^2, the pressure head at a depth of 2.5 m is :
(A) 1 m of water (B) 2 m of water
(C) 3 m of water (D) 3.5 m of water

85. A vertical rectangular plane surface is submerged in water such that its top and bottom surfaces are 1.5 m and 6.0 m respectively below the free surface. The centre of pressure below the free surface will be at a depth of :
(A) 3.75 m (B) 4.0 m (C) 4.2 m (D) 4.5 m

86. A jet strikes a stationary plate normally with a velocity of 8 m/s and the plate suffers a force of 120 N. The power obtained, in kW is :
(A) 0.96 (B) 9.4 (C) Zero (D) 958

87. Which of the following is a dimensionless number ?
(A) Manning's coefficient "n" (B) Pipe friction factor "f "
(C) Chez's coefficient "C" (D) Hazen–William coefficient C_H

88. The momentum correction factor "β" for laminar flow through a circular pipe is :
(A) 1.5 (B) 2.0 (C) 1.67 (D) 1.33

89. The continuity equation is based upon the principle of :
(A) Conservation of energy (B) Conservation of momentum
(C) Conservation of mass (D) None of these

90. For a hydraulically efficient rectangular channel of bed width 4.0 m, the depth of flow is :
(A) 4.0 m (B) 8.0 m (C) 1.0 m (D) 2.0 m

91. For an error of 10% in the measurement of head over a broad crested weir, the error in discharge will be :
(A) 10 % (B) 5 % (C) 15 % (D) 25

92. The flow will be in supercritical state in the following profiles :
(A) M_3, S_3 and M_1 (B) M_2, S_1 and M_3
(C) S_2, S_3 and M_3 (D) S_1, S_2 and S_3

93. In a Sutro weir, discharge is proportional to :
(A) $H^{1/2}$ (B) H (C) $H^{3/2}$ (D) $H^{5/2}$

94. A pump is required to deliver 150 L/s at a head of 45 m when running at 1750 r.p.m. The specific speed of the pump is :
(A) 17.4 (B) 39.0 (C) 89.0 (D) 1233.0

95. Water is pumped through a pipeline to a height of 10 m at the rate of 0.1 m^3/s frictional and other minor losses are 5 meter. Pumping power required, in kW is :
(A) 14.70 (B) 9.80 (C) 20.0 (D) 13.3

96. Theory of probability is applied to :
(A) accidental error only (B) conditional error
(C) both accidental and cumulative (D) residual error

97. The shrinkage factor of an old map is 24/25 and R.F is 1/2400 then the corrected scale for the map is :
(A) $\frac{1}{2400}$ (B) $\frac{1}{2500}$ (C) $\frac{1}{600}$ (D) $\frac{1}{6000}$

98. If the length of a chain line along a slope of "α" is "*l*" the required slope correction is :
(A) $2l \cot^2\alpha/2$ (B) $2l \sin^2\alpha/2$
(C) $l\tan^2\alpha/2$ (D) $l \cos^2\alpha/2$

99. Which of the following is the most precise instrument for measuring horizontal distances ?
(A) Metallic Tape (B) Steel Tape
(C) Tacheometer (D) Tellurometer

100. The whole circle bearing of a line, whose quadrantal bearing is S19°30′E is :
(A) 19° (B) 199°
(C) 160° (D) None of the above

101. The value of dip at the magnetic pole is :
(A) 0° (B) 45°
(C) 90° (D) None of these

102. Stress-strain relation of a material for structural analysis should be
(A) Elastic only (B) Linear only
(C) Elastic and linear (D) Elastic and non-linear

103. The closing error can be balanced by:
(A) Bowditch rule (B) Transit rule
(C) Working accurately latitudes (D) Either (A) or (B) as applicable

104. If "N" is the number of stations and the least count of the instrument is , then the limit on the angular error of closure in traversing should not be :
(A) < 20 N (B) > 20 N (C) < 20 (D) > 20 $\sqrt{N}$

105. What will be the correction for curvature for a distance of 1000 m?
(A) .0673 m (B) .0785 m (C) .0568 m (D) None of these

106. The reading on a 4.0 m staff at a point is observed as 2.895 m. If the staff was 8 cm out of the plumb line, thecorrect reading should have been :
(A) 2.8800 m (B) 2.8937 m (C) 2.8600 m (D) 2.9937 m

107. If the degree of a curve is 1° and if chain length is 30 m, then the radius of the curve is equal to :

(A) 5400 m (B) 1720 m (C) $\frac{1720}{\pi}$ m (D) $\frac{5400}{\pi}$ m

108. The long chord and tangent length of a circular curve of radius R will be equal if the angle of deflection is :

(A) 30° (B) 60° (C) 150° (D) 120°

109. If the radius of a circular curve is five times the length of a transition curve then the spiral angle is given by :

(A) 1/5 rad (B) 1/10 rad (C) 1/20 rad (D) 1/40 rad

110. The resultant of two forces P and Q is R. If Q is doubled, the new resultant is perpendicular to P, then :

(A) P = R (B) Q = R (C) P = Q (D) None of the above is

111. The mass moment of inertia of a rectangular plate of mass M and sides a and b about an axis perpendicular to plate through its centre is :

(A) $\frac{M}{3}\left(a^2+b^2\right)$ (B) $\frac{M}{4}\left(a^2+b^2\right)$

(C) $\frac{M}{12}\left(a^2+b^2\right)$ (D) $M\left(\frac{a^2}{4}+\frac{b^2}{12}\right)$

112. Two circular discs of same weight and thickness are made from metals having different densities. Which disc will have the larger rotational inertia about its central axis ?

(A) disc with larger density (B) disc with smaller density

(C) both discs will have same rotational inertia (D) None of the above

113. For a body subjected to hydrostatic static state of stress, the shear stress on a plane inclined at an angle of 45° with the horizontal will be :

(A) maximum (B) minimum

(C) zero (D) 50% of hydrostatic pressure

114. For the flow to be definitely laminar in a pipe, the value of Reynold's number should be :

(A) < 2000 (B) 2500 (C) 5000 (D) > 5000

115. For critical flow in a rectangular channel for a discharge per unit length of 25 cumec, the critical depth will be :

(A) 2.1 m (B) 1.5 m (C) 4 m (D) 2.75 m

116. The intensity of pressure developed by surface tension of 0.0075 Kg/m in a droplet of water of 0.075 mm diameter is :

(A) 0.08 Kg/cm^2 (B) 0.06 Kg/cm^2 (C) 0.04 Kg/cm^2 (D) 40 Kg/cm^2

117. If there are n pipes of same diameter d laid in parallel in place of a single pipe of diameter D, then :

(a) $d = \frac{D}{n^{2/5}}$ (B) $D = \frac{d}{n^{2/5}}$ (C) $d = \frac{D}{n^{2/3}}$ (D) $d = \frac{D}{n^{1/5}}$

118. If F_r is the Froude number for a flow in a triangular channel, then the Froude number for same velocity and same depth of flow in rectangular channel will be :

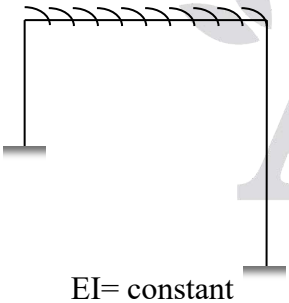
(A) F_r (B) $\sqrt{2}\ F_r$ (C) $\frac{F_r}{\sqrt{2}}$ (D) $\frac{F_r}{\sqrt{3}}$

119. Shape factor is a property which depends :

(A) only on the ultimate stress of the material (B) only on the yield stress of the material

(C) both on yield and ultimate stress of material (D) only on the geometry of the section

120. The rigid-jointed plane frame shown in figure will :



EI= constant

(A) sway to left

(B) sway to right

(C) not sway at all

(D) may sway to left or right depending upon the magnitude of Udl