A.E.E's (ASSISTANT EXECUTIVE ENGINEERS)

(CIVIL ENGINEERING 1992 – 93)

1. The working stress for mild steel specimen is calculated using factor of safety on

1) Breaking stress 2) Ultimate stress

3) Yield point stress 4) None of the above

2. Cup and the cone fracture usually indicates, the material as

1) Elastic 2) Brittle 3) Ductile 4) Plastic

3. Poisson's ratio is defined as ration of

1) Stress to strain 2) Stress to Young's modulus

3) Lateral strain to longitudinal strain 4) Rigidity modulus to bulk modulus

4. In plane structure a hinge support has

1) One Reaction 2) Two Reactions

3) Three Reactions 4) No Reaction

5. Stress - strain relation of a material for structural analysis should be

1) Elastic only 2) Linear only

3) Elastic and linear 4) Elastic and non – linear

6. A simply supported beam with a hinge at midspan is

1) Statically determinate 2) Statically indeterminate

3) Unstable 4) Determinate and unstable

7. Principle of super position is valid in a

1) Statically determinate structure

2) Statically indeterminate structure

3) Structure which obeys Hooke's law

4) Structure which undergoes small deformation

8. Shear force at any section is the algebraic sum of the following force on the either side.

1) Axial forces 2) Transverse forces

3) Moments 4) None of these

9. Bending moment in a cantilever beam is zero at

1) A simple support 2) A fixed support 3) Moments 4) None of these

10. The ration of maximum bending moment in a cantilever beam to that of a simply supported beam of same span and uniformly distributed loading is

1) 1 : 4 2) 1 : 0.25 3) 1 : 2 4) None of these

11. Between point loads the shear varies

1) Constant 2) Linearly 3) Parabolically 4) Cubically

12. The bending moment diag. Due to uniformly varying load is

1) Parabolic 2) Elliptic 3) Hyperbolic 4) Cubic

13. At a given section the shear force varies along the depth as

1) Constant 2) Linearly

3) Parabolically 4) None of these

14. Shear stress in a beam with rectangular cross-section is maximum at

1) Extreme top fibre 2) Neutral axis

3) Extreme bottom fibre 4) Mid–depth

15. The ratio of maximum shear stress to mean stress in triangular cross-section is

1) 1.5 2) 1.33 3) 1.125 4) 1.25

16. Bending stress at a section a maximum at

1) Mid–depth 2) Extreme top and bottom fibre

3) Centroidal axis 4) None of these

17. Section modulus of circular cross-section of diameter D is

1) $\frac{\pi D^2}{64}$ 2) $\frac{\pi D^3}{32}$ 3) $\frac{\pi D^2}{4}$ 4) $\frac{\pi D^4}{32}$

18. The most efficient section to resist bending stress is

1) Rectangular section 2) I–section

3) T–section 4) Circular section

19. For no tension in column of diameter D the eccentricity of compressive load must be

1) $\frac{D}{4}$ 2) $\frac{D}{6}$ 3) $\frac{D}{8}$ 4) $\frac{D}{12}$

20. The ratio of Euler's load for column with both ends hinged to that of with both ends fixed with same length is

1) 1 : 2 2) 1 : 4 3) $1 : \sqrt{2}$ 4) 4 : 1

21. The nature of combined stress in a beam depends on the nature of

1) P only 2) M only 3) P and M both 4) None of these

22. The number of independent stress components at a point in a dimension is

1) 3 2) 6 3) 9 4) 12

23. The principal planes at a point are inclined at

1) 45° 2) 60° 3) 90° 4) 180°

24. Maximum shear stress is equal to

1) Sum of principal stresses

2) Half of the difference of principal stresses

3) Difference of principal stresses

4) None of these

25. Mohr's circle can be used to determine

1) Principal stresses 2) Principal stresses and strains

3) Principal strains only 4) None of these

26. The deflection of elastic curve of a beam is given by

1) $\frac{\iint M.dx}{EI}$ 2) $\frac{\iint W.dx}{EI}$ 3) $\frac{\iint V.dx}{EI}$ 4) $\frac{\iint M_n.dx}{EI}$

27. The number of points of inflexion in a simply supported beam with u.d.l is

1) 0 2) 1 3) 2 4) 3

28. The maximum deflection at the free end of a cantilever subjected to u.d.*l* is

1) $\frac{Wl^3}{16\,EI}$ 2) $\frac{Wl^4}{6\,EI}$ 3) $\frac{Wl^4}{8\,EI}$ 4) $\left(\frac{5}{384}\right) \times \frac{Wl^4}{EI}$

29. The maximum slope in a simply supported beam subjected to a concentrated load at its midspan is

1) $\frac{Wl^3}{16\,EI}$ 2) $\left(\frac{5}{48}\right) \times \frac{Wl^2}{16\,EI}$ 3) $\frac{Wl^2}{16\,EI}$ 4) $\left(\frac{5}{48}\right) \times \frac{Wl^3}{EI}$

30. The unit load method is based on

1) Principle of superposition
2) Maxwell's reciprocal theorem
3) Principle of virtual work
4) Newton's laws of equilibrium

31. The relationship between the three moduli of an elastic material is given by

1) $E = \frac{9KG}{(G + 3K)}$
2) $G = K + E$
3) $K = 2G(3K + G)$
4) None of these

32. Pick the correct bending equation:

1) $\left(\frac{M}{I}\right) = \left(\frac{y}{f}\right) = \left(\frac{E}{R}\right)$
2) $\left(\frac{M}{I}\right) = \left(\frac{f}{y}\right) = \left(\frac{E}{R}\right)$
3) $\left(\frac{M}{R}\right) = \left(\frac{y}{E}\right) = \left(\frac{f}{I}\right)$
4) $\left(\frac{R}{I}\right) = \left(\frac{E}{M}\right) = \left(\frac{y}{f}\right)$

33. A beam of uniform strength has

1) Uniform cross−section
2) Uniform bending moment
3) Uniform stress across the section
4) Same maximum stress at all sections

34. A cantilever beam of span L carries a concentrated load of W at the free and also a total load to W over entire length. The maximum bending moment is

1) WL 2) 1.5 WL 3) 0.25 WL 4) W + 0.25 WL

35. The strain along longitudinal direction is 0.25, if the Poisson's ratio is 0.2, the lateral strain is

1) 0.050 2) −0.050 3) 0.125 4) 1.25

36. The transverse load and shear in a beam has the relation

1) $W = \frac{dV}{dx}$ 2) $V = \frac{dW}{dx}$ 3) V = W.I 4) $V = \frac{d^2W}{dx^2}$

37. The shear stress on the principal plane is

1) Maximum
2) Zero
3) Minimum
4) Equal to one of the principal stress

38. The moment of inertia of a triangular lamina of base width B and height H about its base is

1) $\frac{BH^3}{36}$ 2) $\frac{BH^3}{12}$ 3) $\frac{BH^3}{6}$ 4) None of the above

39. When a circular shaft is subjected to a state of pure torsion the cross – section of the shaft is subjected to

1) Shear stress 2) Bending stress

3) Bending and shear 4) None of above

40. Euler theory is applicable to

1) Short columns 2) Long columns

3) Short and long columns 4) None of the above

41. The mid-span deflection of a fixed beam due to concentrated load at mid-span is

1) $\frac{Wl^3}{48\ EI}$ 2) $\left(\frac{5}{385}\right)\left(\frac{Wl^4}{EI}\right)$ 3) $\frac{Wl^3}{192\ EI}$ 4) $\frac{Wl^3}{384\ EI}$

42. In double overhanging beam for the positive bending moment to be equal to negative bending moment the position of supports must be at

1) 0.25l 2) 0.207l 3) 0.33l 4) None of these

43. The torsion equation of the form

1) $\frac{T}{J} = \frac{f_s}{R} = \frac{q}{r} = \frac{N\theta}{l}$ 2) $\frac{T}{R} = \frac{f}{r} = \frac{g}{j} = \frac{N.l}{\theta}$

3) $\frac{T}{I} = \frac{f}{y} = \frac{E}{R} = \frac{q\theta}{N}$ 4) None of the above

44. For efficient transmission of power the cross section of shaft must be

1) Rectangular 2) Circular 3) Elliptical 4) Hollow circular

45. Bulk modulus is the ratio of

1) Stress and strain 2) Shear stress and strain

2) Stress and volumetric strain 4) Lateral strain and longitudinal strain

46. Gauge length is the ratio of

1) Length of specimen between grips

2) It is 8 times dia of specimen

3) Distance over which change in length is measured

4) Distance between 2 points in the specimen

47. When a bar is fixed at the two ends and subjected to temperature raise the nature of stress developed in the bar is

1) Tensile 2) Compressive 3) Shear 4) None of the above

48. Under uniformly varying load the bending moment varies

1) Linearly 2) Parabolical

3) Cubic parabolically 4) Elliptical

49. The shear stress on principal plane is

1) Minimum 2) Zero

3) Minimum normal stress 4) None of the above

50. If Poisson's ratio is 0.3, its rigidity modulus is

1) 0.77E 2) 0.385E 3) 0.6E 4) 2.4E

51. The first moment of an area 'A' about the y axis in the plane of the area is given by

1) $\int_A xda$ 2) $\overline{y}A$ 3) $\overline{x}dA$ 4) $\int_{\overline{A}} ydA$

52. The center of pressure is

1) At the centroid of sub−merged area

2) The centroid of the pressure prism

3) Independent of the orientation of the area

4) A point on the line of action of the resultant force

53. The pressure in a tank is 50 N/cm^2. The equivalent pressure head of the oil with specific gravity 0.9 is

1) 0.5663 m 2) 5.663 m 3) 56.63 m 4) 566.3 m

54. A circular area of diameter 'd' is vertical and submerged in a liquid. Its upper edge is at liquid surface. Its center of pressure is at depth of

1) $\frac{d}{2}$ 2) $\frac{d}{4}$ 2) $\frac{3d}{8}$ 4) $\frac{5d}{8}$

55. A body floats in a stable equilibrium

1) When its metacentric height is zero

2) When the metacenter is below the center of gravity

3) When $\frac{I}{V}$ is positive

4) When the metacenter is above center of gravity

56. An open tank contains 5 m of water covered with 2m of oil whose specific weight is 8 KN/m^3. The pressure at the interface is

1) 16 KN/m^2 2) 65 KN/m^2 3) 16 N/m^2 4) 65 N/m^2

57. Which of the following velocity fields does not satisfy conservation of mass for in compressible plane flow?

1) u = x, v = −y 2) u = y, v = x

3) u = 2x, v = 2y 4) u = −2x, v = +2y

58. The condition of irrotationality of flow

1) $\frac{\delta^2\Psi}{\delta^2 x} - \frac{\delta^2\Psi}{\delta^2 y} = 0$ 2) $\frac{\delta\Psi}{\delta x} + \frac{\delta\Psi}{\delta y} = 0$

3) $\frac{\delta^2\Psi}{\delta y^2} + \delta^2\Psi + \delta x^2 = 0$ 4) $\frac{\delta^2\Psi}{\delta x^2} + \delta^2\Psi + \delta y^2 = 0$

59. Flownet can be drawn, if

1) Flow is turbulent 2) Fluid is ideal

3) Fluid is unsteady 4) Fluid is viscous

60. Orificemeter is used for measuring

1) Pressure 2) Velocity

3) Volume 4) Volume rate of flow

61. A venturimeter laid 45° to horizontal is connected to a differential mercury manometer. The deflection shown is 'h' cm, if the venturimeter is made horizontal, the deflection in the manometer will be

1) $\frac{h}{2}$ 2) $\frac{h}{\sqrt{2}}$ 3) h 4) $\frac{\sqrt{2}}{h}$

62. The coefficient of discharge of a flow nozzle meter is

1) Greater than a venturimeter

2) Lower than a orificemeter

3) Greater than both the venturimeter and orificemeter

4) Lower than a venturimeter but greater than orificemeter

63. Pitot tube can be used to measure velocity

1) Only in pipe flow 2) Only in open channel flow

3) Only in compressible flow 4) In all the three types stated above

64. A cippoletti weir is one

1) Which is a rectangular weir with end contractions

2) Which can be treated as rectangular weir with out any end contractions.

3) Which is combination of a rectangular and triangular weir

4) Which is combination of a rectangular and circular weir

65. The ratio of inertial forces to pressure forces yield

1) Reynold's number 2) Mach number

3) Euler number 4) Cauchy number

66. Bernoulli's equation for compressible fluid flow is

1) The same as that of incompressible flow

2) Not at all same as that of incompressible flow except pressure energy term

3) The same as incompressible flow except pressure energy term

4) The same as incompressible flow except kinetic energy term

67. A coloured dye is injected at a point in water flow. The resulting visible line is a

1) Stream line 2) Streak line

3) Path line 4) None of the above

68. In forced vortex flow, velocity V and radial distance r are related as

1) $V \alpha r$ 2) $V \alpha \frac{1}{r}$ 3) $V \alpha \frac{1}{r^2}$ 4) $V \alpha r^2$

69. The non−dimensional parameter connected with cavitation is

1) Mach number 2) Cauchy number

3) Thoma number 4) Strouhal number

70. The lower critical Reynold's number of pipe flow is

1) 5000 2) 2000 3) 3000 4) 3200

71. The velocity distribution for Laminar flow through closed pipe is

1) Linear 2) Elliptical 3) Parabolic 4) Trapezoidal

72. For laminar flow through circular pipe the ratio of average velocity to maximum velocity is

1) 0.75 2) 0.50 3) 0.25 4) 1.50

73. For a flow between two reservoirs connected by a series pipeline, the head loss due to friction is proportional to

1) Q 2) $\frac{1}{Q}$ 3) Q^2 4) $\frac{1}{Q^2}$

74. Loss of head in pump's foot valve.....

1) $\frac{0.5\ v^2}{2g}$ 2) $\frac{v^2}{2g}$ 3) $\frac{1.5\ v^2}{2g}$ 4) $\frac{v^2}{g}$

75. A jet of water 5 cm in diameter impinges on a flat normally with 18 m/sec velocity. If the plate is moving in the same direction at 12 m/sec force exerted on the plate is

1) 5547 N 2) 565.5 N

3) 5.65 N 4) 554.7 N

76. A turbine develops 1600 KW while running at 360 rpm under 8 m head. The turbine shall be

1) Kaplan turbine 2) Francis turbine

3) Pelton whell 4) Turbo impulse wheel

77. A turbine develops 600 KW under a head of 30 m at 450 rpm. Speed. The speed and power at 24 m head is

1) 1070 rpm. 429 KW 2) 403 rpm, 429 KW

3) 429 rpm, 403 KW 4) 1070 rpm, 403 KW

78. A draft tube is a part of the installation of a

1) Propeller turbine

2) Pelton turbine

3) Turbo impulse wheel

4) All the above turbines

79. The function of a governor in a turbine is to

1) Give maximum overall efficiency

2) Give maximum hydraulic efficiency

3) Control the speed of the runner

4) Control the flow through the runner

80. Run away speed of a turbine is the one at

1) Maximum efficiency 2) Optimum efficiency

3) Zero load 4) Minimum input

81. In a pelton wheel the depth of the bucket is approximately

1) 0.5 diameter of jet 2) 0.95 diameter of jet

3) 1.5 diameter of jet 4) 1.90 diameter of jet

82. Tubular turbines are low head, low power

1) Kaplan turbines 2) Propeller turbines

3) Francis turbines 4) Pelton turbines

83. Turbine constants are

1) Input power, output power

2) Input power, flow through runner, output power

3) Unit power, unit speed, specific speed

4) Unit power, unit speed, unit discharge

84. The motion that helps in the working of a centrifugal pump is

1) Radaial flow
2) Free vortex flow
3) Forced vortex flow
4) Axial flow

85. A centrifugal pump converts

1) Electrical energy to mechanical energy

2) Kinetic energy to pressure energy

3) Pressure energy to kinetic energy

4) Mechanical energy to electrical energy

86. A centrifugal pump when used to work with compressible fluid flow it is called

1) A diffusor
2) A nozzle converter
3) A compressor
4) A pressure converter

87. In a centrifugal pump the work done by the impeller is

1) The manometric head

2) Greater than manometric head

3) Less than manometric head

4) The manometric head less losses

88. A turbine pump is

1) A diffuser vane pump
2) A single volute pump
3) A double volute pump
4) A variable speed pump

89. A multi−stage centrifugal pump is equivalent to

1) Centrifugal pumps connected in parallel

2) Centrifugal pumps connected in series

3) Centrifugal pumps connected in series first and coupled to parallel pumps

4) Centrifugal pumps connected in parallel first and coupled to series connection

90. If N is speed of rotation of impeller and Q is the discharge delivered, then the manometric head can be expressed as

1) $H_m = AN^2 + BNQ^2 + CQ$
2) $H_m = AN^2 + BN^2Q + CQ^2$
3) $H_m = AN^2 + BNQ + CQ^2$
4) $H_m = AN^2 + BNQ^2 + CQ^3$

91. In a centrifugal pump, cavitation occurs generally

1) In the volute chamber
2) In the impeller
3) In the shaft
4) In the casing

92. An isentropic flow is

1) An accelerating adiabatic flow
2) A retarding adiabatic flow
3) A reversible adiabatic flow
4) An irreversible adiabatic flow

93. The continuity equation for one dimensional compressible fluid flow is

1) $d(\rho AV) = 1$
2) $d(\rho AV) = 0$
3) $\rho d(AV) = 1$
4) $\rho d(AV) = 0$

94. Mach angle in a compressible fluid flow is formed for flows with mach number

1) Less than one
2) Equal to one
3) Greater than one
3) Very very less than one

95. Flow through a diffuser in a compressible flow will have

1) Rise in temperature
2) Fall in temperature
3) Fall in temperature and pressure
4) Fall in temperature and rise in pressure

96. A normal shock wave is

1) An infinite pressure wave
2) A mild finite pressure wave
3) A steep finite pressure wave
4) A steep infinite pressure wave

97. If Q is heat transfer, E is energy and W is work, then energy equation for compressible flow is

1) $dE = dQ + dW$
2) $dW = dQ + dE$
3) $dE = dQ - dW$
4) $dW = dE = dQ$

98. For an isentropic air flow the stagnation temperature is given by

1) $T_0 = T[1 + 0.4M^2]$
2) $T_0 = T(1 - 0.4\ M^2]$
3) $T_0 = T[1 + 0.2\ M^2]$
4) $T_0 = T[1 - 0.2M^2]$

99. A hot wire anemometer works with

1) Constant voltage & constant temperature
2) Constant voltage or constant temperature
3) Constant current and constant temperature
4) Constant temperature or constant current

100. For isentropic flow through a convergent divergent nozzle the area ratio is given for air.

1) $\frac{A}{A_1} = \frac{1}{M}\left[\frac{(5 - M^2)}{6}\right]^3$
2) $\frac{A}{A_1} = \frac{1}{M}\left[\frac{(5 + M^2)}{6}\right]^3$
3) $\frac{A}{A_1} = \frac{1}{M}\left[\frac{(M^2 - 5)}{6}\right]^3$
4) $\frac{A}{A_1} = M\left[\frac{(M^2 - 5)}{6}\right]^3$

ANSWERS

1-2; 2-3; 3-3; 4-2; 5-3; 6-4; 7-4; 8-2; 9-1; 10-2; 11-1; 12-1; 13-1; 14-2; 15-1; 16-2; 17-2; 18-2; 19-3; 20-2; 21-2; 22-1; 23-3; 24-2; 25-2; 26-1; 27-3; 28-3; 29-3; 30-3; 31-1; 32-2; 33-4; 34-2; 35-2; 36-1; 37-2; 38-2; 39-1; 40-2; 41-3; 42-2; 43-1; 44-4; 45-3; 46-3; 47-2; 48-3; 49-2; 50-2; 51-1; 52-4; 53-3; 54-4; 55-4; 56-1; 57-3; 58-4; 59-2; 60-4; 61-2; 62-4; 63-4; 64-2; 65-3; 66-3; 67-2; 68-1; 69-3; 70-2; 71-3; 72-2; 73-3; 74-1; 75-4; 76-1; 77-2; 78-1; 79-3; 80-1; 81-2; 82-1; 83-4; 84-3; 85-2; 86-3; 87-2; 88-1; 89-2; 90-2; 91-2; 92-3; 93-2; 94-3; 95-4; 96-3; 97-3; 98-3; 99-4; 100-3.