<u>ASSISTANT EXECUTIVE ENGINEERS (Notification No. 09/2018)</u>

<u>Civil and Mechanical</u>

<u>Final key</u>

Q1 For the coplanar concurrent system of forces shown if Fig. 1, the system will be

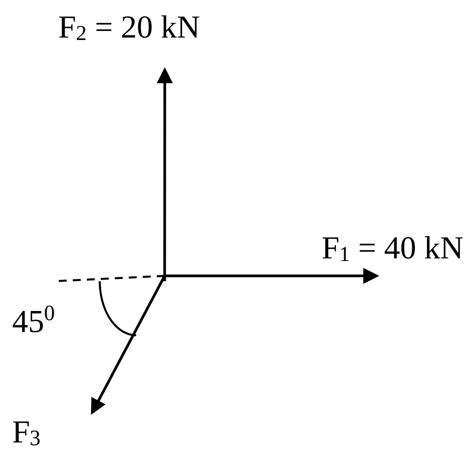

Fig. 1

<u>will not be in-equilibrium whatever be the magnitude of F_3</u>

Q2 The resultant of two forces, when they act at an angle of $60^0$is $\sqrt{148}N$. If the same forces are acting at right angles, their resultant is10N. Determine the magnitude of the two forces.

<u>8 N & 6 N</u>

Q3 Four forces of magnitude 20N, 40N, 60N and 80N are acting respectively along the four sides of the square ABCD as shown in Fig. 2. Determine the magnitude of the resultant force.

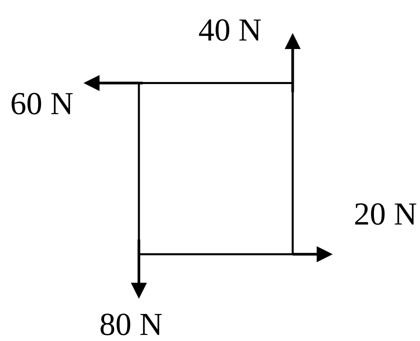

Fig. 2

$40\sqrt{2}$ N

Q4 Determine the force in member BD of a cantilever truss shown in Fig. 3. This truss is supported on wall at AE.

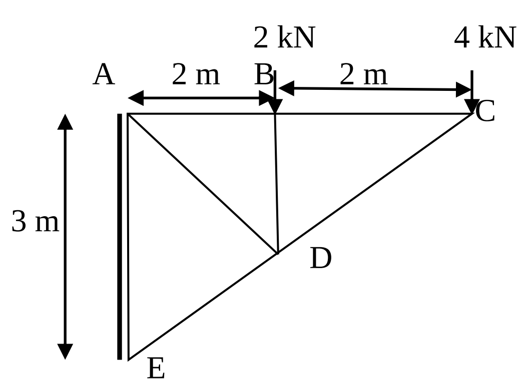

Fig. 3

2 kN compressive

Q5 The force required to pull a body of weight 100N on a rough horizontal plane is 30N. Determine the co-efficient of friction if the same force is applied at an angle of 30^0 with the horizontal.

0.305

Q6 Determine the force in member EC of a cantilever trust shown in Fig. 4.

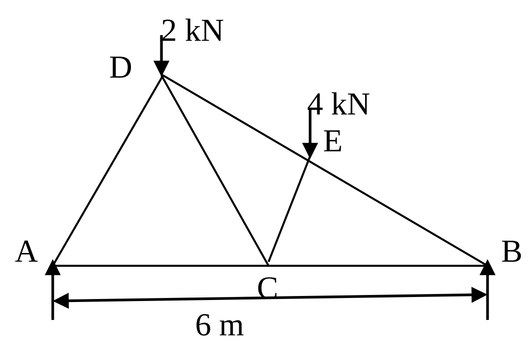

Fig. 4

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Q7 If a beam with the rectangular cross section is obtained by cutting from circular log of timber, then for the beam to have strongest section in bending, the ratio of breadth to depth should be

0.707

Q8 A free bar of length '*l*' is uniformity heated from 0°C to a temperature t^0C, α is the coefficient of linear expansion and E is the modulus of elasticity. The stress in the bar is

zero

Q9 Young's modulus of elasticity and Poisson's ratio of a material are 1.2×10^5 MPa and 0.34 respectively. The modulus of rigidity of the material is

0.4477×10^5MPa

Q10 If the cross-section of a member is subjected to a uniform shear stress of intensity 'q', then the strain energy stored per unit volume is equal to (G=modulus of rigidity)

$q^2/2G$

Q11 The Poisson's ratio of a material which has Young's modulus of 120 GPa, and shear modulus of 50 GPa, is

0.2

Q12 A 120mm long and 60mm diameter steel rod fits snugly between two rigid walls 120mm apart at room temperature. Young's modulus of elasticity and coefficient of linear expansion of steel are 2×10^5 N/mm^2 and $12 \times 10^{-6}/^0C$ respectively. The stress developed in the rod due to a 100^0C rise in temperature will be

240 N/mm^2

Q13 The stretch in a steel rod of circular section, having a length *l* subjected to a tensile load *P* and tapering uniformity from a diameter d_1, at one end to a diameter d_2 at the other end, is given by

$4Pl/\pi E d_1 d_2$

Q14 A bar of copper and steel form a composite system. They are heated to a temperature of 40^0C. What type of stress is induced in the copper bar?

compressive

Q15 A solid uniform metal bar of diameter D and length *L* is hanging vertically from its upper end. The elongation of the bar due to self weight is

Proportional to L^2 but independent of D

Q16 Steel has its yield strength of 415 N/mm^2 and modulus of elasticity of $2x10^5$ MPa. Assuming the material to obey Hooke's law up to yielding, what is its proof resilience?

0.430 N/mm^2

Q17 A bar is subjected to an axial tensile stress. If the volumetric strain in the bar is 0.4 times the axial strain, what is the Poisson's ratio of the material?

0.30

Q18 A bar of a square section (a x a) subjected to a tensile load *P* on a plane inclined at 45^0 to the axis of the bar, normal stress will be

$$\frac{P}{2a^2}$$

Q19 A spherical ball of volume $1000cm^3$ is subjected to a hydrostatic pressure of 100 $N/mm^2$and bulk modulus of the material is 200 kN/mm^2. What is the change in volume of the ball?

500 mm^3

Q20 A composite bar is made of steel and aluminium strips, with A_a=$4A_s$where A_a and A_s are areas of cross-section of aluminium and steel bars, respectively E_s/E_a =3. Due to an external load, if the stress developed in the aluminium is 30 MPa, then what is the stress developed in the steel bar?

90 MPa

Q21 A copper bar of area of cross section $200mm^2$ is encased in a steel tube of area of cross section $400mm^2$. Due to an external load, the stress in copper bar is 10 MPa and load on composite bar is *P*. What is the load shared by the steel bar ? $\frac{E_s}{E_{cu}} = 2$

0.8 *P*

Q22 A bimetallic strip is made of two metals with equal areas of cross section. Due to temperature change, the stress developed in one strip is 40 N/mm^2. What is the stress developed in another component of the composite bar?

-40 N/mm^2

Q23 Strain energy stored in a body of volume V subjected to uniform stress σ is

$$\frac{\sigma^2 V}{2E}$$

Q24 For the state of stress of pure shear τ, the strain energy stored per unit volume in the elastic, homogeneous isotropic material having elastic constants E and v will be

$\tau^2(1+v)/E$

Q25 For the beam ABCD, shown in the given Fig. 5, is loaded by udl of intensity 'w' on whole length such that the maximum positive bending moment is equal to the maximum negative bending moment. The value of L_1 is

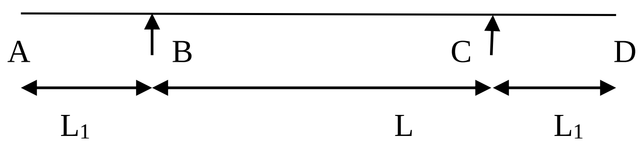

Fig. 5

$$\frac{L}{2\sqrt{2}}$$

Q26 If the bending moment diagram for a simply supported beam is of the form as given in Fig.6, then the load acting on the beam is

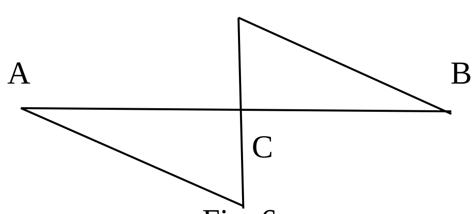

Fig. 6

a moment applied at C

Q27 A simply supported beam is loaded as shown in the Fig. 7. The maximum shear force in the beam will be

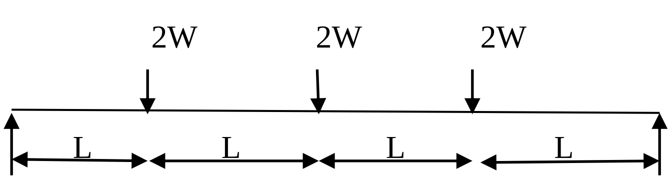

Fig. 7

3 W

Q28 In a simply supported beam of length 'L' with a triangular load varying from zero at one end to the maximum value 'w' at the other end, the maximum bending moment is:

$$\frac{wL^2}{9\sqrt{3}}$$

Q29 The fixed end moment M_A of the beam ABCD as shown in Fig.8, is

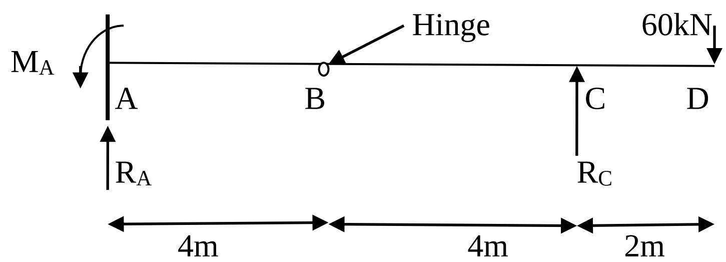

Fig. 8

-120kNm

Q30 A simply supported beam ABCD with equal overhang on both sides is loaded as shown in the Fig. 9. If the bending moment at mid-span is zero, then the percentage overhang on each side will be

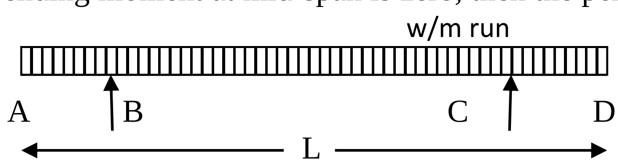

Fig. 9

25

Q31 The width required for a beam of uniform strength having a constant depth d, length L, simply supportedat the endsand subjected tocentral load W is

$$\frac{3WL}{2fd^2}$$

Q32 Cross section of two beams A (600 mm x 200 mm) and B (200mmx600mm) are shown in Fig. 10. Both the beams have the same material. By how many times is the beam A stronger than the beam B in resisting bending

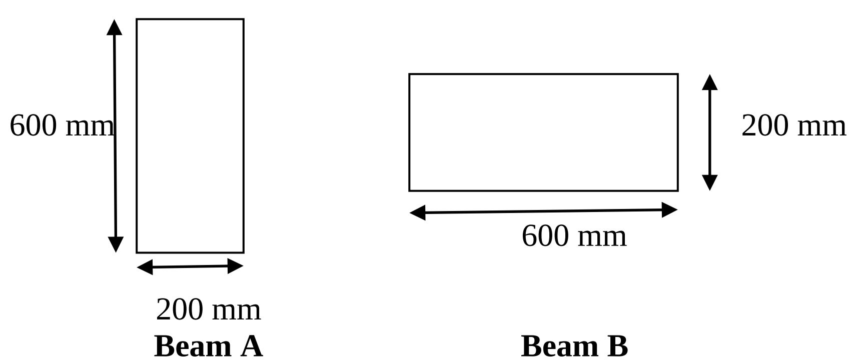

Fig.10

3

Q33 Maximum shear stress in a circular cross-section is

$$\frac{4}{3}q_{av}$$

Q34 At a point in a strained body carrying two unequal unlike principal stresses p_1 and p_2 (p_1>p_2) the maximum shear stress is given by

$(p_1+p_2)/2$

Q35 The stresses acting on an element is shown below in the Fig.11, are

σ_x= 90 MPa, σ_y= 30 MPa and $\tau_{xy} = 40 MPa = \tau_{yx}$

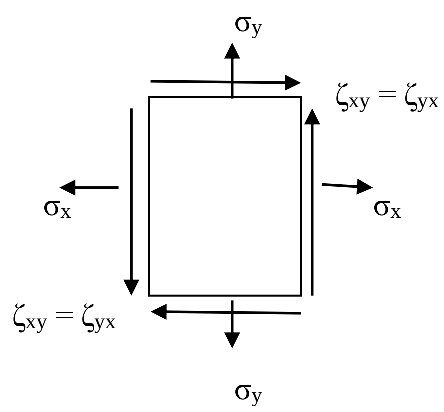

Fig. 11

The radius of Mohr's circle 'r' and principal stresses σ_1 and σ_2 are in (MPa) respectively.

50, 110, 10

Q36 The radius of Mohr's circle of stress of a strained element is 20 N/mm^2 and minor principal tensile stress is 10 N/mm^2. The major principal stress is

50 N/mm^2

Q37 Normal stresses of equal magnitude σ but of opposite signs, act at a point of a strained material in perpendicular direction. What is the magnitude of the stress on a plane inclined at 45^0 to the applied stresses?

Zero

Q38 The principal stresses σ_1, σ_2 and σ_3 at a point respectively are 80MPa, 60MPa and -40MPa. The maximum shear stress is

60 MPa

Q39 The major and minor principal stresses at a point are 140 MPa and 60MPa respectively, on the plane passing through the point, the shear stress on the plane is 20 MPa. What is the angle of this plane with the plane of major principal stress?

15^0

Q40 If maximum principal stresses $\sigma_1 = 60$ N/mm^2, σ_2 = 60 N/mm^2 and σ_3 of value zero act on a cube of unit dimensions, then the maximum shear stress energy stored in it would be

$\frac{600}{G}$

Q41 In a 2D stress system, the two principal stress are p_1=180 N/mm^2(tensile) and p_2 (compressive). For the materials, yield stress in simple tension and compression is 240 N/$mm^2$and Poisson's ratio is 0.25. According to maximum normal strain theory for what value of $p_2$shall yielding occur in compression?

240 N/mm^2

Q42 For the case of slender column of length $'l'$ and flexural rigidity,EI built in its base and free at the top, the Euler's buckling load is :

$$\frac{\pi^2 EI}{4l^2}$$

Q43 For no tension in column of diameter D, the eccentricity of the compressive load must be less than

D/8

Q44 If diameter of a long column is reduced by 20%, the percentage reduction in Euler's buckling load is

59

Q45 A hollow circular column of internal diameter 'd' and external diameter '1.5d' is subjected to compressive load. The maximum distance of the point of application of load from the centre for no tension is

$13d/48$

Q46 A column of length 3.0 m area of cross-section 2,000 mm^2 and moment of inertia of I_{xx}=720x10^4 mm^4 and I_{yy}=80x10^4 mm^4 is subjected to buckling load. Both the ends of the column are fixed. What is the slenderness ratio of column ?

75

Q47 The buckling load for a column pinned at both ends is 12 kN. If the ends are fixed, the buckling load changes to

48 kN

Q48 An effort of 100 N is applied to a machine to lift a load of 900 N. The distance moved by the effort is 100cm. The load is raised through a distance of 10cm. The efficiency of the machine is

90 %

Q49 The efficiency of lifting machine is 60% when an effort of 10 N is required to raise a load of 600 N. The velocity ratio of the machine is

100

Q50 The maximum efficiency (η_{max}) of a lifting machine is given as

$$\frac{1}{\mathrm{m} \times (\mathrm{V.R.})}$$

Q51 Ideal effort required to run a machine is

less than actual effort

Q52 If the work is done by the machine in a reverse direction, the machine is known as

reversible

Q53 The law for an ideal machine is given by
P=mW

Q54 In a lifting machine an effort of 15 N raised a load of 70 N and an effort of 19 N raised a load of 90 N. The effort required to lift a load of 100 N is
21 N

Q55 Virtual work is the product of
force and virtual displacement

Q56 A load of 2.5 kN is to be lifted by a screw jack, having threads of 10mm pitch. The efficiency of the jack at this load is 60%. The effort required at the end of a handle of 50 cm length is
13.26 N

Q57 The number of teeth on the worm-wheel of a single threaded worm and worm wheel is 60, the diameter of effort wheel is 25cm and that of load drum is 12.5cm. The effort required to lift a load of 600 N by this machine is 30 N. The efficiency of the machine is
16.66%

Q58 If the force is acting at an angle of 90^0 with the direction of motion of the body, the work done will be
zero

Q59 A hollow shaft of inner radius 30mm and outer radius 50mm is subjected to a twisting moment. If the shear stress developed at inner radius of shaft is 60 N/mm^2. What is the maximum shear stress in shaft?

100 N/mm^2.

Q60 A solid shaft of diameter D carries a twisting moment that develops maximum shear stress τ. If the shaft is replaced by hollow one of outside diameter 'D' and inside diameter D/2, then the maximum shear stress will be
1.067 τ

Q61 A shaft is turns at 180 rpm under a torque of 150 Nm. Power transmitted is
0.$90\pi kW$

Q62 A close coiled helical spring of stiffness 4N/mm is in series with another spring of stiffness 6 N/mm. What is the stiffness of composite spring?
2.4 N/mm

Q63 The outside diameter of a hollow shaft is twice its inside diameter. The ratio of its torque carrying capacity to that a solid shaft of the same material and the same outside diameter is
15/16

Q64 The ratio of the moment of resistance of a solid circular shaft of diameter D and a hollow shaft (external diameter D and internal diameter d) is given by:

$$\frac{D^4}{D^4 - d^4}$$

Q65 A spring with 25 active coils cannot be accommodated within a given space. Hence 10 coils of the spring are cut. What is the stiffness of the new spring?
1.66 times the original spring

Q66 The diameter of shaft B is twice that of shaft A. Both shafts have the same length and are of the same material. If both are subjected to same torque, then the ratio of the angle of twist of shaft A to that of shaft B will be
16

Q67 A close coiled helical spring has 100mm mean diameter and is made of 20 turns of 10mm diameter steel wire. The spring carries an axial load of 120 N. Modulus of rigidity is 84 GPa. The shearing stress developed in the spring in N/mm^2 is

$96/\pi$

Q68 Hoop stress and longitudinal stress in a boiler shell under internal pressure are 80 N/mm^2 and 40N/mm^2 respectively. Young's modulus of elasticity and Poisson's ratio of the shell material are 200 GN/m^2 and 0.3 respectively. The hoop strain in boiler shell is:
0.34×10^{-3}

Q69 A thick walled hollow cylinder having outside and inside radii of 90mm and 40mm respectively is subjected to an external pressure of 800 MN/m^2. The maximum circumferential stress in the cylinder will occur ata radius of
40 mm

Q70 A thick cylinder with internal diameter *d* and outside diameter 2*d* is subjected to internal pressure *p*. Then the maximum hoop stress developed in the cylinder is

$\frac{5}{3}p$

Q71 A thin cylindrical shell is subjected to internal pressure *P*. The Poisson's ratio of the material of shell is 0.3. Due to internal pressure, the shell is subjected to circumferential strain and axial strain. The ratio of circumferential strain to axial strain is:
4.25

Q72 A thin cylinder contains fluid at a pressure of 450 N/m^2 the internal diameter of the shell is 0.6m and the tensile stress in the material is to be limited to 9000 N/m^2. The shell must have a minimum wall thickness of nearly
15.0 mm

Q73 The ratio of circumferential stress to longitudinal stress in a thin cylinder subjected to internal hydrostatic pressure is
2

Q74 The radius of gyration of a rectangular section (depth d, width b) from a centroidal axis parallel to the width is:
0.28d

Q75 A thin cylinder of thickness 't', width 'b' and internal radius 'r' is subjected to a pressure 'p' on the entire internal surface. What is the change in radius of the cylinder? (μ is the Poison's ratio and E is the modulus of elasticity)?

$$\frac{pr^2(2-\mu)}{2Et}$$

Q76 The absolute pressure at the depth of 10 m below the free surface of water will be [ρ_{water} =1000 kg/m^3, g = 9.81 m/s^2, P_{atm} = 0.1 MPa]

198.1 kPa

Q77 The ratio of kinematic viscosity (ν) to dynamic viscosity (μ) is known as

specific volume

Q78 What will be mass of air in a room of sides 4m x 4m x 4m at 100 kPa and 27ºC? [R_{air} = 0.287 kJ/kg-K]

74.332 kg

Q79 A 0.5mm diameter glass tube is inserted into water at 20ºC. What will be the capillary rise of water in tube? [σ = 0.073 N/m, contact angle of water with glass is 0º]

59.53 mm

Q80 What will be absolute pressure at point in flow field, if vacuum pressure is 0.07 MPa? [P_{atm} = 0.1 MPa]

0.03 MPa

Q81 A simple U-tube manometer is used to measure the pressure of oil (specific gravity = 0.9) flowing in a pipe line. Its right limb is open to atmosphere and left limb is connected to the pipe. The center of the pipe is 10 cm below the level of Hg (Specific gravity = 13.6) in the right limb. If Hg level in the right limb is 15 cm higher than that of in left limb, what will be the gauge pressure of the oil in the pipe?

19.57kPa

Q82 What will be the internal pressure in the soap bubble of 2 cm diameter? [σ = 0.08 N/m]

32 N/m^2 above atmospheric pressure

Q83 A circular disc of diameter D is immersed vertically in a liquid of density ρ. The topmost point of the disc just touches the free liquid surface. The depth of center of pressure from free surface will be

$\frac{5D}{8}$

Q84 A stone weighs 500 N in air and 200 N in water. The specific gravity of stone will be

1.67

Q85 An open tank of base 2 m x 2 m contains water upto a height of 2.5 m. The tank is put in an elevator which is moving upwards at an acceleration of 2 m/s^2. What will be the force on the bottom of the tank?

118.1 kN

Q86 An open cylindrical tank of 1m diameter and 2m high contains water upto 1.5 m depth. What will be the maximum angular velocity that can be attained without spilling the water, if cylinder rotates about its vertical axis?

8.858 rad/s

Q87 The least radius of gyration of a ship is 8 m and metacentric height 75 cm. The time period of oscillation of the ship will be

18.53 sec

Q88 Lagrangian method in fluid motion is

To identify a fluid particle and its motion is described for entire duration of study

Q89 The velocity and density in diffuser are given by $u = u_0 e^{-x/L}$ and $= \rho_0 e^{-2x/L}$. What will be the rate of change of density at $X = L$?

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Q90 The stream function in a flow field is given by $\psi = 2xy$.The resultant velocity at (2,3) will be

$\sqrt{52}$ m/s

Q91 Angular velocity in two-dimensional (x, y) flow field is given by

$$\frac{1}{2}\left(\frac{\partial v}{\partial x} - \frac{\partial u}{\partial y}\right)$$

Q92 Continuity equation in polar coordinates for 2D, steady, incompressible flow will be

$$\frac{\partial}{\partial r}(rV_r) + \frac{\partial}{\partial \theta}(V_\theta) = 0$$

Q93 Continuity equation in Cartesian coordinate for incompressible flow is given as

$\vec{\nabla}.\vec{V} = 0$

Q94 Free vortex flows are characterized by [v_r = Radial velocity, v_θ = Tangential velocity, c = Constant, ω = Angular velocity]

$$v_r = 0, v_\theta = \frac{c}{r}$$

Q95 Hydraulic gradient line represents the variation of

Piezometric head in the flow

Q96 At the section1 of a smoothpipe of uniform diameter 25 cm, the pressure and elevation are 50 kPa and 10 m. At the section 2, the pressure and elevation are 20 kPa and 12 m. The velocity in the pipe is 1.25 m/s. The head loss and direction of flow will be

1.057 m; from section 1 to 2

Q97 A 300 mm x 150 mm venturimeter is inserted in a vertical pipe carrying water, flowing in upward direction. A differential mercury manometer connected to the inlet and throat gives the reading of 20 cm. What will be the theoretical discharge?(SG_{Hg}=13.6)

128.3 liter/s

Q98 A pitot static tube measures the stagnation pressure head as 8 m and static pressure head as 6 m. The velocity of the flow will be (C_v = 0.97)

6.07 m/s

Q99 A submarine is cruising at a depth of 15m below the sea surface. If the forward speed of submarine is 20 km/hr, what will be pressure at the front stagnation point? [$\rho_{seawater}$ = 1030 kg/m^3]

167.46 kPa(gauge)

Q100 Vena contracta is

Point at which the jet of fluid has minimum cross-sectional area after coming out of opening

Q101 Dimension of "energy" is

ML^2T^{-2}

Q102 Dimension of kinematic viscosity is

L^2T^{-1}

Q103 Pressure drop in a pipe flow is [V = Average velocity, L = Length of pipe, D= Diameter of pipe, $\mu = dynamic\ viscosity$]

$$\frac{32\mu VL}{D^2}$$

Q104 A laminar flow taking place in a pipe of diameter 200 mm. The maximum velocity is 1.5 m/s. What will be velocity at 40 mm from the wall of the pipe?

0.96 m/s

Q105 A fluid is flowing through a circular pipe of diameter 100 mm. The maximum shear stress at the pipe wall is 196.2 N/m^2. What will be the pressure gradient?

-7848 Pa/m

Q106 Friction factor (f) for laminar flow in circular pipe is

$$\frac{64}{Re}$$

Q107 Volume flow rate (Q) of laminar flow through a horizontal pipe of diameter(D),length(L) is [μ = Viscosity, ΔP= Pressure drop in length$L$]

$$Q = \frac{\pi D^4 \Delta P}{128 \mu L}$$

Q108 A sphere of diameter 2 mm falls 150 mm in 20 seconds in a viscous liquid. The density of sphere is 8000 kg/m^3 and of liquid 950 kg/m^3. The dynamic viscosity of liquid will be [Consider constant velocity of sphere]

20.5 poise

Q109 Momentum correction factor is defined as [V = Velocity at any point in flow, V_{av}= Average velocity of the flow,$V_{max} = M$aximum velocity of the flow A= Cross-section area of flow]

$$\frac{1}{A}\int \left(\frac{V}{V_{av}}\right)^2 dA$$

Q110 The momentum correction factor for fully developed turbulent flow through pipe is approximately given by

1.01-1.04

Q111 Linear momentum equation for steady flow is [α = Kinetic energy correction factor, β = momentum correction factor, $\vec{F}$ = net force acting on control volume, $\vec{V}$ = velocity of flow, $\dot{m}$ = mass flow rate]

$$\sum \vec{F} = \sum_{out} \beta \dot{m} \vec{V} - \sum_{in} \beta \dot{m} \vec{V}$$

Q112 Oil of kinematic viscosity 0.4 stokes is flowing through a pipe of diameter 300 mm at the rate of 0.3 m^3/s. What will be head loss due to friction for a 50 m length of the pipe [Friction factor for turbulent flow = $\frac{0.316}{(R_e)^{1/4}}$, for $10^4 < R_e < 10^5$]

3.62 m

Q113 A pipe of diameter 0.2 m is suddenly enlarged to a diameter 0.4 m. If flow rate is 250 liter/s, what will be the head loss due to this enlargement?

1.815 m

Q114 Three pipes of length L_1, $L_2$and L_3 of diameter d_1, $d_2$and $d_3$respectively are connected in series. If these pipes are replaced by a single pipe of length ($L_e = L_1 + L_2 + L_3$), then diameter of equivalent pipe (d_e) is given by relation of [Assuming friction factor to be same for all the pipes]

$$\frac{L_e}{d_e^5} = \sum_{i=1}^{3} \frac{L_i}{d_i^5}$$

Q115 Hydraulic radius is given as [A = Cross-sectional area of flow, P = Wetted perimeter]

$$\frac{A}{P}$$

Q116 In a hydroelectric plant, the head available is 450 m of water and is connected with a penstock pipe of 25 cm diameter and length 3.6 km (Friction factor = 0.014). What will be maximum power available at pipe outlet?

0.551 MW

Q117 A main pipe is branched into two parallel pipes (1 &2), which again forms one pipe.

The length and diameter of pipe1 are 2000 m and 1.0 m respectively, while the length and diameter of pipe2 are 2000 m and 0.8 m. If total flow rate is 3 m^3/s, what will be the flow rate in pipe 1? [Friction factor for each pipe is 0.005]

1.907 m^3/s

Q118 The water is flowing through a pipe of 2 km long at a velocity of 2 m/s. The pipe is provided with a valve at the end. If valve is closed in 20 seconds, what will be pressure developed? [Velocity of sound = 1460 m/s]

0.2 MPa

Q119 Displacement thickness (δ^*) is expressed as

$$\delta^* = \int_0^\delta \left(1 - \frac{u}{U}\right) dy$$

Q120 Momentum thickness (θ) is expressed as

$$\theta = \int_0^\delta \frac{u}{U}\left(1 - \frac{u}{U}\right) dy$$

Q121 A flat plate 1.5 m x 1.5 m moves at 50 km/hr in stationary air of density 1.15 kg/m^3. Lift force will be [C_L = 0.75]

187.1 N

Q122 The drag coefficient for sphere with creeping flow is given as

$$\frac{24}{Re}$$

Q123 If the power to overcome aerodynamics drag of an aircraft remains the same, what will be the percentage increase in velocity, if there is a reduction of 15% in drag coefficient?

5.56 %

Q124 What will be the force exerted by a jet of water of diameter 80 mm on a stationary flat plate, when the jet strikes the plate normally with the velocity of 25 m/s?

3.14 kN

Q125 A jet of water of 30 mm diameter strikes a vertical hinged (from top) square plate (weight =1 kN) at its center with a velocity of 25 m/s. What will be the deflection of plate with vertical?

26.2°

Q126 Maximum efficiency of pelton turbine is [k = Blade velocity coefficient, β = Outlet angle of bucket]

$$\frac{1 + k\cos\beta}{2}$$

Q127 Mechanical efficiency (η_m)of runner of turbine is

$$\eta_m = \frac{\text{Power available at the shaft of the turbine}}{\text{Power delivered by water to the runner}}$$

Q128 Shaft power for hydraulic turbine is given by [P = Power, ρ = Density of fluid, Q= Volume flow rate of fluid, H= Head of fluid]

$$P = \rho Q g H$$

Q129 Specific speed of turbine is expressed as [N = Speed, P = Power, H = Head]

$$\frac{NP^{1/2}}{H^{5/4}}$$

Q130 A turbine develops 9MW while running at 100rpm under head of 30m. If the head on the turbine reduces to 20m, what will be the speed (rpm) and power developed (MW) respectively by the turbine?

81.65 rpm, 4.89 MW

Q131 NPSH is related to

Pumps

Q132 Head coefficient (C_H), which is a dimensionless pump parameter, may be given as

$$\frac{gH}{N^2D^2}$$

Q133 'Hydrograph' depicts the variation in

Discharge with time

Q134 Which of the following is not the element of hydroelectric power plant?

Condenser

Q135 A small reservoir in which the water level rises or falls to reduce the pressure swings so that fluctuations are not transmitted to the closed conduits is known as

Surge tank

Q136 Which of the following is not the type of "spillways"?

Energy spillway

Q137 Data of hydroelectric power plant are:

Available head = 27 m

Catchment area = 430 km^2

Rainfall = 150 cm/year

Percentage of total rainfall utilized = 65%

Penstock efficiency = 95%

Turbine efficiency = 80%

Generator efficiency = 86%

What will be power developed?

2.3 MW

Q138 Check valves are used to

Allow the flow in one direction only and blocks the flow in the opposite direction

Q139 4/2 way directional control valve signifies

2 position, 4 port

Q140 Which of the following is not the pressure control valve?

Shuttle valve

Q141 Which of the following is not the direction control valve?

Counterbalance valve

Q142 A pressure relief valve has a pressure setting of 150 bar. What will be the power loss across the valve, if all the flow returns back to the tank at a rate of 1.6 liter/sec from the pump?

24 kW

Q143 The primary part of a circuit is operating at 190 bar. A secondary circuit supplied from the primary circuit via a pressure-reducing valve require a constant flow of 1.0 liter/sec at 110 bar. What will be the power loss over pressure reducing valve?

8 kW

Q144 Thoma's cavitation parameter is defined as [H= Head developed by pump, NPSH= Net positive suction head]

$$\frac{NPSH}{H}$$

Q145 Euler equation of turbomachine is based on

Angular momentum principle

Q146 Velocity of sound may be expressed as [P= pressure, ρ= density, s=entropy]

$$\sqrt{\left(\frac{\partial P}{\partial \rho}\right)_s}$$

Q147 A circular plate of diameter 0.75 m is immersed in a liquid of specific gravity 0.8, with its plane making an angle of 30° with horizontal. The center of the plate is at a depth of 1.5 m below the free surface. What will be the depth of center of pressure?

1.5058 m

Q148 A 25 cm diameter pipe carries oil of specific gravity 0.9 at a velocity of 3 m/s. This pipe diameter reduces to 20 cm at another section. What will be the velocity at that section?(neglecting all the losses)

4.68 m/s

Q149 A small block of weight 200 N is placed on an inclined plane which makes an angle $\theta = 30^0$ with the horizontal. What is the component of this weight, parallel to the inclined plane.

100 N

Q150 Three like parallel forces 400N, 200N and 300N are acting at points A, B, C respectively on a straight line ABC. The distances are AB=30cm,BC=40cm and AC=70cm. Find the resultant and also the distance of the resultant from point A on line ABC.

30 cm