Section – II – CIVIL ENGINEERING

1 If three forces P, Q and R keep a body in equilibrium, the angle between P & Q is 90º and R is acting vertically downward, then magnitude of forces R and Q respectively in terms of P will be

1) $P/\sqrt{2}$, $\sqrt{2}P$

2) $\sqrt{2}P$, $P/\sqrt{2}$

3) P, $\sqrt{2}P$

4) $\sqrt{2}P$, P

2 The algebraic sum of moments of two unlike parallel forces about any point in their plane will be

1) Zero

2) Constant

3) Always anticlockwise

4) Always clockwise

3 If the number of members (m) in a frame having joints (j) is more than that required by the equation m=2j-3, then such frames called

1) Ideal frame

2) Imperfect frame

3) Perfect frame

4) Redundant frame

4 A steel bar of 500mm length is under tensile stress of 100 N/mm^2. If the modulus of elasticity is 2x10^{11} N/m^2, then the total elongation of the bar will be

1) 0.25 mm

2) 2.50 mm

3) 5.00 mm

4) 0.50 mm

5 Hoop stress for a wooden wheel with steel flat tyre in terms of outside diameter of the wheel *D*, inside diameter of the tyre *d* and Young's modulus *E* is

1) E(D-d)/d

2) E(D/d)

3) E(D/(D-d))

4) E(d/D)

6 A tensile force of P is applied on a compound bar having two members X and Y. Then the load shared by the member X is

1) $\frac{PA_X E_X}{A_X E_X + A_Y E_Y}$

2) $\frac{PA_Y E_Y}{A_X E_X + A_Y E_Y}$

3) *P/2*

4) $\frac{PE_X}{E_Y}$

7 Relation between the elastic constants E and C for poisson's ratio of 0.25 is

1) E=10C

2) E=5C

3) E=2.5C

4) E=0.25C

8 The radius of Mohr's circle represents

1) Minimum normal stress

2) Maximum normal stress

3) Minimum shear stress

4) Maximum shear stress

9 For an inclined plane in a rectangular block subjected to two mutually perpendicular normal stresses 1000 MPa and 400 MPa and shear stresses 400 MPa, the maximum normal stress will be

1) 1200 MPa

2) 700 MPa

3) 600 MPa

4) 200 MPa

10 At a hinge in a beam

1) Shear force is zero

2) Bending moment is maximum

3) Bending moment is zero

4) Bending moment changes sign

11 The bending moment for a beam with equal overhangs and carrying equal point loads each of P at the free ends, the shear force for the beam portion between the supports is

1) Zero

2) equal to P

3) Linearly varying from –P to +P

4) Linearly varying from 0 to P

12 Assumption made in the theory of bending is

1) Radius of curvature is small

2) Radius of curvature is large

3) Transverse sections of the beam do not remain plane after bending

4) Doesn't follow Hook's law in bending

13 In a beam of rectangular cross section, the ratio of the maximum shear stress to the average shear stress is

1) 2.50

2) 2.00

3) 1.50

4) 1.33

14 A simply supported beam of 10 m span is carrying a load of 4.8 kN at mid span. If Young's modulus of elasticity (E) is $2x10^8$ kN/m^2 and moment of inertia (I) is 20 cm^4, then the maximum deflection will be

1) 5.00 mm

2) 2.50 mm

3) 0.50 mm

4) 0.25 mm

15 The differential equation of flexure is

1) $EI\frac{d^2y}{dx^2} = -M$

2) $EI\frac{dy}{dx} = M^2$

3) $EI\frac{d^2y}{dx^2} = M^2$

4) $M\frac{d^2y}{dx^2} = -EI$

16 The slenderness ratio of free standing column of length 4 m and 40mmx40mm section is

1) 115.2

2) 230.4

3) 692.8

4) 346.8

17 Euler's crippling load for a column of length l with both ends hinged and flexural rigidity EI is given by

1) $P= 2\pi^2EI/l^2$

2) $P= \pi^2EI/l^2$

3) $P= 4\pi^2EI/l^2$

4) $P= \pi^2EI/(4l^2)$

18 For shaft in torsion

1) $\frac{q}{r} = \frac{I}{J}$

2) $\frac{C\theta}{l} = \frac{I}{J}$

3) $\frac{q}{r} = \frac{C\theta}{l}$

4) All the above

19 The ratio of maximum shear stress of a solid shaft of diameter D to that of a hollow shaft having external diameter D and internal diameter 0.5D is

1) 0.50

2) 1.00

3) 1.50

4) 0.94

20 Section modulus (Z) for a rectangular cross section is

1) $bh^3/12$

2) $bh^3/6$

3) $bh^2/12$

4) $bh^2/6$

21 The reaction at a roller support of beam will be

1) Tangential to support

2) Normal to support

3) Unknown in direction

4) Inclined to support

22 For a beam subjected to point loads, the shear force between point loads

1) is constant

2) varies linearly

3) has parabolic variation

4) always remain zero

23 The Strain energy stored due to bending for a cantilever beam of span l, Modulus of elasticity E, moment of inertia I and a point load P at free end is

1) $P^2l^3/(6EI)$

2) $P^2l^5/(40EI)$

3) $P^2l^3/(96EI)$

4) $P^2l^5/(240EI)$

24 The method in which a single equation is formed for all loads on the beam and the equation constructed in such a way that the integral constants apply to all the sections of the beam is

1) Moment area method

2) Conjugate beam method

3) Macaulay's method

4) 6method of super position

25 A cantilever beam with UDL of w N/m for entire length of L will have maximum deflection equal to

1) $wL^4/(48EI)$

2) $5L^4/(384EI)$

3) $wL^4/(8EI)$

4) $wL^4/(3EI)$

26 What is poise?

1) Unit of viscosity

2) Dyne-sec/cm^2

3) 0.1 times Ns/m^2

4) All the above.

27 Surface tension has the units of

1) Nm

2) N/m

3) N/m^2

4) N/m^3

28 The ratio of specific heat of a gas at constant pressure and the specific heat of the gas at constant volume

1) is always constant

2) varies with temperature

3) varies with pressure

4) is not constant

29 A perfect gas obeys

1) Boyle's law only

2) Charles' law only

3) both Boyle's law and Charles' law

4) None of the above

30 The thermal efficiency of an engine, which is supplied heat at the rate of 15000 Nm/s and gives an output of 4500 W is

1) 45%
2) 50%
3) 30%
4) 33%

31 Micro-manometer is used to

1) determine low pressure difference
2) determine higher pressure difference
3) pressure measurement for gases only
4) measure pressure in congested areas

32 PrandIt's Pitot tube measures

1) Stagnation head only
2) Pressure head only
3) Velocity head and Stagnation head
4) Pressure head and Stagnation head

33 Based on principle of conservation of energy, the equation derived for an ideal fluid is

1) Bernoulle's Equation
2) Newton's Law of Viscosity
3) Impulse – momentum equation
4) Continuity equation

34 Mouthpiece has increased net head when compared to small orifice due to

1) turbulence in the tube
2) vena contracta occurred within the tube

3) smaller length of the tube

4) smooth boundary of the tube

35 If Velocity potential satisfies Laplace equation the flow will be

1) Irrotational flow

2) Free vortex flow

3) Continuous flow

4) Forced vortex flow

36 The ratio of viscous forces to inertial forces is called

1) Mach number

2) Weber number

3) Reynolds number

4) Froude number

37 If the position of meta centre remain lower than centre of gravity of the floating body, the body will remain in a state of

1) Stable equilibrium

2) Unstable equilibrium

3) Neutral equilibrium

4) None of the above

38 The error in discharge due to error in the measurement of head over a rectangular notch is given by

1) $\frac{dQ}{Q} = \frac{1}{2}\frac{dH}{H}$

2) $\frac{dQ}{Q} = \frac{3}{2}\frac{dH}{H}$

3) $\frac{dQ}{Q} = \frac{3}{4}\frac{dH}{H}$

4) $\frac{dQ}{Q} = \frac{5}{2}\frac{dH}{H}$

39 Impulse momentum equation gives relationship between force (F), mass (m) and velocity (v) as

1) $F = v\frac{dm}{dt}$

2) $F = \frac{1}{m}\frac{dv}{dt}$

3) $F = \frac{d(mv)}{dt}$

4) $F = v\frac{dv}{dt}$

40 In turbulent flow, the loss of head is approximately proportional to

1) Velocity

2) (Velocity)$^{1/2}$

3) (Velocity)$^{3/4}$

4) (Velocity)^2

41 A rigid pipe of length L, diameter D, wall thickness t and modulus of elasticity E is conveying water with a mean velocity of V. If mass density and bulk modulus of water are ρ and K respectively, then water hammer due to sudden closure in the pipe will cause increase in pressure equal to

1) $\rho LV/t$

2) $V\sqrt{\rho K}$

3) $V\sqrt{\frac{\rho}{(\frac{1}{K} + \frac{D}{Et}}}$

4) None of the above

42 The discharge from a centrifugal pump is 100 lpm and the leakage is 11 lpm. Then the volumetric efficiency of the pump is

1) 89%

2) 90%

3) 99%

4) 80%

43 Draft tube for a reaction turbine is arranged for

1) Safety purpose only

2) Increasing velocity head

3) Converting kinetic head into pressure head

4) Diverting water only

44 Which hydraulic turbine more efficient at part load operation?

1) Pelton wheel

2) Francis turbine

3) Propeller turbine

4) Kaplan turbine

45 In an inward flow reaction turbine, velocity of flow at the inlet is 2 m/s. if the guide vanes make an angle of 30º to the tangential velocity direction of the runner, the absolute velocity of the water leaving the guide vanes is

1) 1 m/s

2) 2 m/s

3) 3 m/s

4) 4 m/s

46 In a laminar boundary layer over a flat plate, the growth of the boundary layer with distance x from leading ledge is given by δ/x is proportional to Reynolds number (Re_x) as

1) $Re_x^{1/2}$
2) $Re_x^{-1/2}$
3) $Re_x^{1/5}$
4) $Re_x^{-1/5}$

47 The cavitation parameter σ is defined in terms of net positive suction head (NPSH) and net head H as

1) NPSH/√H
2) H/NPSH
3) H/√NPSH
4) NPSH/H

48 The momentum correction factor is used to account for

1) Change in direction of flow
2) Change in pressure
3) Non uniform distribution of velocity
4) Unsteady flow

49 Centre of Pressure is

1) Always below the centroid of the submerged plane
2) Always at the centroid of the submerged plane
3) Always above the centroid of the submerged plane
4) Anywhere with respect to the centroid of the submerged plane

50 What is a condition for a hydraulically efficient channel

1) Minimum flow rate.
2) Maximum wetted perimeter.

3) Constant velocity.

4) Minimum wetted perimeter.

KEY TO Section II CIVIL ENGINEERING

Q.NO	Answer		Q.NO	Answer
1	4		26	4
2	2		27	2
3	4		28	1
4	1		29	3
5	1		30	3
6	1		31	1
7	3		32	4
8	4		33	1
9	1		34	2
10	3		35	3
11	1		36	3
12	2		37	2
13	3		38	2
14	2		39	3
15	1		40	4
16	3		41	2
17	2		42	2
18	4		43	3
19	4		44	4
20	4		45	4
21	2		46	2
22	1		47	4

23	1		48	3
24	3		49	1
25	3		50	4

Section – III – CIVIL ENGINEERING

1. The Indian standard brick size is

    1) 19 cm x 9 cm x 9 cm

    2) 18 cm x 9 cm x 9 cm

    3) 20 cm x 10 cm x 10 cm

    4) 20 cm x 10 cm x 9 cm

2 The first class brick immersed in water for 24 hours should not absorb water (by weight) more than

    1) 5%

    2) 10%

    3) 15%

    4) 20%

3 Seasoning of timber is done for

    1) To reduce weight only

    2) To make it soft only

    3) To prevent shrinkage and warping

    4) To increase moisture content

4 IS 12269 deals with

    1) 53 grade Ordinary portland cement

    2) 43 grade Ordinary portland cement

    3) 33 grade Ordinary portland cement

4) Sleeper cements

5 Workability of concrete may be measured by

1) Slump test

2) Minimum void method

3) Maximum density method

4) Fineness modulus method

6 Ultrasonic pulse velocity measurements may be used to establish

1) Homogeneity of concrete

2) Presence of cracks and voids

3) Quality of concrete in relation to standard requirements

4) All the above

7 In the analyses of plane frame, the stiffness factor at a joint is taken equal to the sum of stiffness factors the members connected to the joint by using

1) Principle of virtual work

2) Principle of angular momentum

3) Principle of super position

4) Principle minimum work done

8 The principle of virtual work is applied to elastic system by considering virtual work done by

1) Internal forces only

2) External forces only

3) Internal as well as external forces

4) None of the above

9 The deflection at any point of a perfect frame can be obtained by applying a unit load at the joint in

1) The direction in which the deflection is required

2) Vertical direction

3) Horizontal direction

4) Inclined direction

10 In the procedure of Macaulay's method, for getting the deflection equation

1) The differential equation of flexure is integrated for once

2) The differential equation of flexure is integrated for twice

3) The differential equation of flexure is integrated for thrice

4) None of the above

11 The Castigliano's second theorem can be used compute deflections

1) In statistically determinate structures only

2) At the point under the load only

3) for beams and frames only

4) For any type of structure

12 The width of analogous column in the method of analogy is

1) 2/(EI)

2) 1/(EI)

3) 1/2(EI)

4) 1/4(EI)

13 In slope deflection equations, the deformations are considered to be caused by

1) Axial force

2) Shear force

3) Bending moment

4) All the above

14 As per IS-800, the minimum pitch of bolts in a row of bolts is recommended as the diameter of the bolt times

1) 2.0
2) 2.5
3) 3.0
4) 4.0

15 In a fillet weld, the weakest section is the

1) smaller side of the fillet

2) throat of the fillet

3) side perpendicular to force

4) side parallel to force

16 In rolled steel beams, major part of bending moment is resisted by

1) Flanges

2) Web

3) Flanges and web

4) Flanges, web and fillets

17 Load on connection is not eccentric for

1) Lap joint

2) Single cover butt joint

3) Double cover butt joint

4) All the above

18 A steel column in a structure carries a load of 125 kN. It is built up of 2 ISMC 350 channels connected by lacing. The lacing carries a load of

1) 125 kN

2) 12.5 kN

3) 3.125 kN

4) Zero

19 The section in which concrete is not fully stressed to its maximum permissible value while stress in steel reaches its maximum value, is called

1) Under reinforced section

2) Critical section

3) Over reinforced section

4) Balanced section

20 The centre to centre spacing of vertical stirrups, in a rectangular reinforced concrete beam is

1) increased towards the centre of the span of the beam.

2) decreased towards the centre of the span of the beam.

3) increased at the ends

4) maintained nonuniformly.

21 Maximum reinforcement in an RCC beam of dimension b x D shall not exceed

1) 0.06 bD
2) 0.04bD
3) 0.02 bD
4) 0.08bD

22 The diameter of longitudinal bars in a column should not be less than

1) 4 mm

2) 8 mm

3) 12 mm

4) 16 mm

23 The profile of the prestressing steel in prestressed concrete member follows

1) Axial force diagram

2) Shear force diagram

3) Bending moment diagram

4) None of the above

24 The technique for establishing and maintaining priorities among various jobs of a project, is known

1) Event flow scheduling technique

2) short interval scheduling

3) Critical ratio scheduling

4) Slotting technique for scheduling

25 The performance of a specific task in CPM, is known

1) Dummy

2) Event

3) Contract

4) Activity

26 If a is the optimistic time, b is the pessimistic time and m is most likely time of an activity, the expected time of the activity, is

1) (a+m+b)/6

2) (a+2m+b)/6

3) (a+4m+b)/6

4) (a+5m+b)/6

27 The field capacity of a soil is 25%, its permanent wilting point is 15% and specific dry unity weight is 1.5, if the depth of root zone of a crop, is 80 cm, the storage capacity of the soil, is

1) 8 cm

2) 10 cm

3) 12 cm

4) 14 cm

28 One of the basic assumptions made in unit hydrograph theory is

1) Rainfall is uniform all over the catchment

2) Base flow is considered

3) Rainfall varies with time

4) All the above

29 A process determining outflow pattern from reservoirs for any given pattern of inflow, storage and tail-water condition is known as

1) Hydrograph

2) Flood discharge

3) Runoff estimate

4) Flood routing

30 The recording type rain-guage gives

1) Mass curve of rainfall

2) Hydrograph

3) Total rainfall of 24 hours period

4) Monthly rainfall

31 Lacey's regime width (W) for a channel having flood discharge of Q is given by

1) $W= 1.35(Q)^{1/2}$

2) $W= 4.75 (Q)^{1/2}$

3) $W= 1.35 (Q)^{1/3}$

4) $W= 4.75(Q)^{1/3}$

32 The solid roller bucket is arranged at the end of a spillway to

1) measure the discharge

2) provide stability to the spillway

3) trap silt from flowing water

4) dissipate energy through hydraulic jump

33 To avoid gravity dam failure by crushing for the dam material of allowable stress 300 t/sq.m and specific gravity 2.4, the limiting height is equal to

1) 88.23 m

2) 125.25 m

3) 214.29 m

4) >214.29 m

34 The recommended maximum water supply needs as per CPHEEO guidelines for metropolitan and mega cities where sewerage system is existing or contemplated in litres per capita per day (lpcd)

1) 45

2) 70

3) 136

4) 150

35 Dental caries, a disease caused by drinking water due to

1) Excess fluorine

2) Absence of fluorine

3) Excess of nitrates

4) Presence of lead

36 If the BOD of a diluted sample in 1:100 ratio is 11 ppm in the beginning and 8 PPM at the end of 5 days, then BOD of the sample is

1) 300 PPM

2) 950 PPM

3) 137.5 PPM

4) 73 PPM

37 The peak factor suggested by CPHEEO for computing carrying capacity in the design of sewers for the contributory population of 20,000 is

1) 2.00

2) 2.25

3) 2.50

4) 3.00

38 The tolerance limit of pH for industrial effluents discharged into inland surface waters

1) Less than 5.5

2) 5.5 to 9.0

3) Above 9.0

4) Must be 7 only

39 Relationship involving voids ratio (e), degree of saturation (S), water content (w) and specific gravity of soil solids (G) is given by

1) wSe=G

2) we=SG

3) wS=Ge

4) wG=Se

40 A clay soil sample has unconfined compression strengths in the undisturbed state and remoulded state are 200 kN/sq.m and 60 kN/sq.m respectively. Then its sensitivity is

1) 260

2) 140

3) 0.3

4) 3.33

41 The core-cutter method for determining in-situ unit weight is suitable for

1) Soils containing gravel particles

2) Stiff clays

3) Soft cohesive soils

4) Sandy soils

42 The average permeability for flow perpendicular to bedding planes when compared to the average permeability for the flow parallel to the bedding planes

1) Always less

2) Always greater

3) Always equal

4) Lesser or greater

43 The earth pressure theory that is used for the design of cantilever retaining wall is

1) Meyerhof's theory

2) Rankine's theory

3) Terzagi's theory

4) Skempton's theory

44 California bearing ratio (CBR) is a

1) measure of soil strength

2) procedure for designing flexible pavements

3) method of soil identification

4) measure to indicate the relative strengths of paving materials

45 Correct length of a 100 m tape, weighing 24 N when pull of 200 N is applied at the ends is freely suspended is

1) 100.12 m

2) 100.06 m

3) 99.88 m

4) 99.94 m

46 If the radius of a circular is 100 m and deflection angle is 90°, then the length of backward tangent is

1) 141.4 m

2) 70.7 m

3) 100 m

4) 50 m

47 Northing, easting and elevation are obtained in

1) Chain surveying

2) Compass surveying

3) Auto Level surveying

4) Total station surveying

48 The type of Bitumen for which the viscosity has been decreased by a volatile dilutant is known as

1) Super Bitumen

2) Cutback Bitumen

3) Lighter Bitumen

4) Fast Bitumen

49 Benkelman beam deflection method is used for design of

1) Rigid overlay on rigid pavement

2) Flexible overlay on flexible pavement

3) Flexible overlay on rigid pavement

4) Rigid overlay on flexible pavement

50 The absolute minimum radius for a horizontal curve designed for a speed of 80 KMPH, given the permissible values of super elevation and coefficient of friction are 0.04 and 0.16

1) 458 m

2) 252 m

3) 150 m

4) 105 m

KEY TO SECTION III CIVIL ENGINEERING

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6	4		31	2
7	3		32	4
8	3		33	1
9	1		34	4
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11	4		36	1
12	2		37	4
13	3		38	2
14	2		39	4
15	2		40	4
16	1		41	3
17	3		42	1
18	3		43	2

19	1		44	1
20	1		45	4
21	2		46	3
22	3		47	4
23	3		48	2
24	3		49	2
25	4		50	2