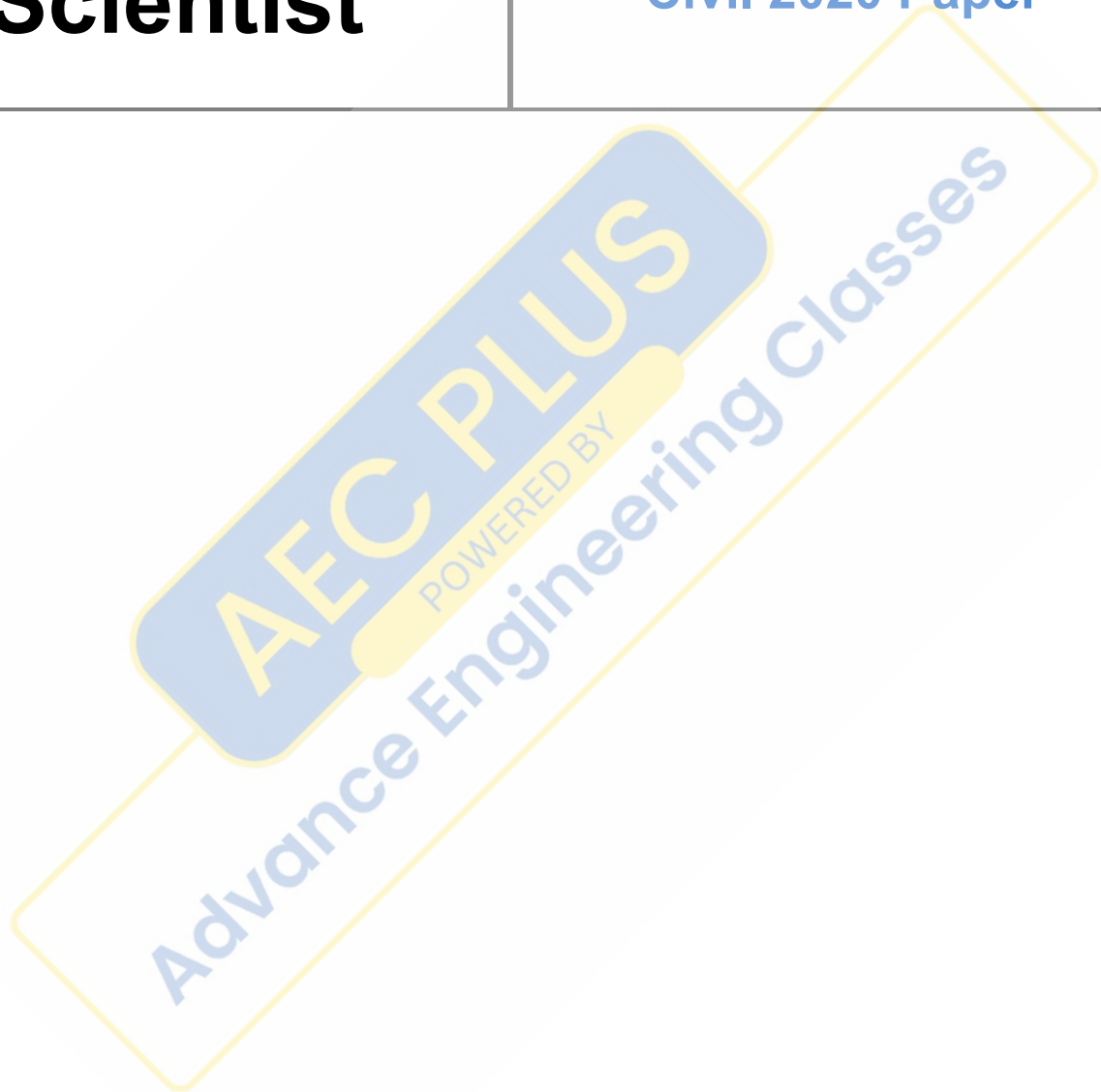


ISRO Scientist

Previous Year Paper
Civil 2020 Paper



80 Questions

Que. 1 The type of bond in a brick masonry, containing alternate courses of stretchers and headers, is called:

1. Stretcher bond
2. English bond
3. Flemish bond
4. Header bond

Correct Option - 2

Que. 2 The unit of moment of inertia of an area is

1. kg/m
2. kg/m^2
3. m^4
4. m^3

Correct Option - 3

Que. 3 A steel rod of 30 mm diameter and 3 m length is subjected to an axial pull of 50 kN. If $E = 200 \times 10^9$ Pa, the elongation of the rod will be

1. 2.225 mm
2. 1.062 mm
3. 0.525 mm
4. 3.152 mm

Correct Option - 2

Que. 4 The shape of the bending moment diagram over the length of a beam, carrying a uniformly increasing load is always

1. Linear
2. Parabolic
3. Cubic
4. Circular

Correct Option - 3

Que. 5 Every material obeys Hooke's law within its

1. Dimensional limit
2. Plastic point
3. Limit of proportionality
4. Failure limit

Correct Option - 3

Que. 6 An ideal flow of a liquid obeys

1. Continuity equation
2. Newton's law of viscosity

3. Newton's second law of motion
4. Dynamic viscosity law

Correct Option - 1

Que. 7 A pipe contains an oil of specific gravity 0.9. A differential manometer connected at the two points A and B shows a difference in mercury levels as 15 cm. The difference of pressure at the two points A and B will be (Note: consider the density of mercury as 13600 kg/m^3)

1. 18688 N/m^2
2. 15981 N/m^2
3. 288 N/m^2
4. 6528 N/m^2

Correct Option - 1

Que. 8 Hydrograph is the graphical representation of

1. runoff and time
2. surface runoff and time
3. ground water flow and time
4. rainfall and time

Correct Option - 1

Que. 9 The quantity of water retained by the subsoil against gravity is known as:

1. Yield
2. Porosity
3. Specific yield
4. Specific retention

Correct Option - 4

Que. 10 A soil has a bulk density of 2.3 g/cm^3 and water content 15%, the dry density of soil sample is

1. 2.0 g/cm^3
2. 1.5 g/cm^3
3. 1.0 g/cm^3
4. 2.5 g/cm^3

Correct Option - 1

Que. 11 The seepage exit gradient in a soil is the ratio of

1. Total head to the length of the seepage
2. Flow line to slope
3. Head upstream to that at downstream
4. Head loss to the length of the seepage

Correct Option - 4

Que. 12 A phreatic line is defined as the line within a dam section below which there is/are-

1. Negative equipotential lines

2. Positive hydrostatic pressure
3. Positive equipotential lines
4. Negative hydrostatic pressure

Correct Option - 2

Que. 13 A saturated soil sample has water content of 40% and specific gravity of soil particle is 2.7. The void ratio of the soil is

1. 0.4
2. 0.52
3. 1.08
4. 2.0

Correct Option - 3

Que. 14 Separation of coarse aggregates from mortar during transportation is known

1. bleeding
2. creeping
3. segregation
4. shrinkage

Correct Option - 3

Que. 15 Rapid hardening cement attains early strength due to _____.

1. larger proportion of lime grounded finer than normal cement
2. proportion of lime grounded coarser than normal cement
3. lesser proportion of lime grounded finer than normal cement
4. larger proportion of lime grounded coarser than normal cement

Correct Option - 1

Que. 16 If d and n are the effective depth and depth of the neutral axis respectively of a singly reinforced beam, the lever arm of the beam, is

1. d
2. n
3. $d + n/3$
4. $d - n/3$

Correct Option - 4

Que. 17 Minimum spacing between horizontal parallel reinforcement bars of different diameters should not be less than:

1. One diameter of thinner bar
2. One diameter of a thicker bar
3. Sum of the diameters of the thinner and thicker bars
4. Twice the diameter of the thinner bar

Correct Option - 2

Que. 18 Characteristics load means that value of load which has a _____ % probability of not being exceeded during the life of structure.

1. 5
2. 20
3. 95
4. 99

Correct Option - 3

Que. 19 Upon mixing water to the concrete ingredients, hydration takes place. The correct sequence of stages of hydration process are:

1. Hardening, setting, loss of workability
2. Loss of workability, setting, hardening
3. Setting, loss of workability, hardening
4. Hardening, loss of workability, setting

Correct Option - 3

Que. 20 A column splice is used to increase :

1. length of the column
2. strength of the column
3. cross – sectional area of the column
4. none of these

Correct Option - 1

Que. 21 The distance traveled by a moving vehicle during perception and brake reaction time is known as

1. Sight distance
2. Stopping distance
3. Lag distance
4. Permissible distance

Correct Option - 3

Que. 22 As per IRC recommendations, the maximum limit of super elevation for mixed traffic in hill roads not bound by snow is

1. 1 in 15
2. 1 in 12.5
3. 1 in 10
4. Equal to camber

Correct Option - 3

Que. 23 The time by which an activity completion time can be delayed without affecting the early start of the succeeding activities is known as:

1. Duration
2. Total float
3. Free float
4. Interfering float

Correct Option - 3

Que. 24 One Newton's force produces an acceleration of

1. 1 cm/sec^2 while acting on a body of 1 gm mass
2. 1 cm/sec^2 while acting on a body of 1 kg mass
3. 1 m/sec^2 while acting on a body of 1 kg mass
4. 1 m/sec^2 while acting on a body of 1 gm mass

Correct Option - 3

Que. 25 Effective buckling length of a steel angle connected by double rivets is

1. $0.7 L$
2. $0.85 L$
3. L
4. $1.3 L$

Correct Option - 2

Que. 26 Web crippling in steel beam occurs due to:

1. Column action of compression flange
2. Failure of web under concentrated load
3. Excessive bending moment
4. Secondary bending moment

Correct Option - 2

Que. 27 The self-weight of a steel roof truss in N/m^2 may be computed by: (span = l)

1. $(l/3) + 5$
2. $[(l/3) + 5] \times 10$
3. $(l/3) - 5$
4. $[(l/3) - 5] \times 10$

Correct Option - 2

Que. 28 A 40 cm diameter circular timber column is 4 m long. The slenderness ratio of the column is

1. 4
2. 10
3. 20
4. 40

Correct Option - 4

Que. 29 For a given aggregate ratio increasing the water cement ratio:

1. Increases the strength
2. Decreases shrinkage
3. Increases shrinkage
4. Does not cause any change in shrinkage.

Correct Option - 3

Que. 30 Generally the ratio of different ingredients (Cement Sand and aggregate) in concrete mix of grade M20 is:

1. 1: 2: 4

2. 1: 1.5: 3
3. 1: 3: 6
4. 1: 1: 2

Correct Option - 2

Que. 31 Which of the following is not considered in the design of the isolated footings?

1. Bending moment
2. Shear
3. Punching stress
4. Torsion

Correct Option - 4

Que. 32 In limit state approach, spacing of main reinforcement controls primarily:

1. Collapse
2. Deflection
3. Cracking
4. Durability

Correct Option - 3

Que. 33 What is the angle of dip at magnetic poles of earth?

1. Zero
2. 45°
3. 90°
4. 180°

Correct Option - 3

Que. 34 If the reduced bearing of line AB is N 30° E and length is 100 m, then the latitude and departure respectively of the line AB will be:

1. + 86.6 m, + 50 m
2. + 50 m, + 86.6 m
3. + 86.6 m, - 50 m
4. - 86.6 m, + 50 m

Correct Option - 1

Que. 35 A circular curve has 300 m radius and 60-degree deflection angle. The length of curve and tangent length respectively are:

1. 200 m, 150 m
2. 314.16 m, 173.21 m
3. 305.68 m, 158.73 m
4. 450 m, 220 m

Correct Option - 2

Que. 36 The ranging operation in a survey is a process of

1. Reconnaissance
2. Judging the distance

3. Establishing intermediate points between terminals
4. Determination of slope

Correct Option - 3

Que. 37 Zenith is the point on the celestial sphere

1. Just below the observer's station
2. Just above the observer's station
3. Just on the left of the observer's station
4. None of the above

Correct Option - 2

Que. 38 The fineness modulus of fine aggregate is 2.78 and of coarse aggregate is 7.82 and the desired fineness modulus of mixed aggregate is 6.14. What is the amount of fine aggregate to be mixed with one part of coarse aggregate?

1. 55%
2. 50%
3. 45%
4. 40%

Correct Option - 2

Que. 39 Slump test is performed to measure

1. plasticity of concrete
2. Young's modulus of concrete
3. Compressive stress of concrete
4. Tensile stress of concrete

Correct Option - 1

Que. 40 What is the ratio of flexural strength (f_{cr}) to the characteristic compressive strength of concrete (f_{ck}) of M25 grade concrete?

1. 0.08
2. 0.11
3. 0.14
4. 0.17

Correct Option - 3

Que. 41 Which of the following tests compares the dynamic modulus of elasticity of samples of concrete?

1. Compression test
2. Ultrasonic pulse velocity test
3. Split test
4. Tension test

Correct Option - 2

Que. 42 The bulk modulus of elasticity of a material is twice its modulus of rigidity. The Poisson's ratio of the material is

1. 1/7

2. 2/7
3. 3/7
4. 4/7

Correct Option - 2

Que. 43 Two planks each of 50 mm × 50 mm section are glued together along the length to form a section 50 mm × 100 mm and used as a beam. If the shear force at a section is 1000 N, what is the maximum shear on the glue?

1. 0.15 MPa
2. 0.3 MPa
3. 0.6 MPa
4. 2.4 MPa

Correct Option - 2

Que. 44 At a certain point in a structural member, there are perpendicular stresses 80 N/mm² and 20 N/mm², both tensile. What is the equivalent stress in simple tension, according to the maximum principal strain theory? (Poisson's ratio = 0.25)

1. 0 N/mm²
2. 20 N/mm²
3. 60 N/mm²
4. 75 N/mm²

Correct Option - 4

Que. 45 Two simply supported beams are made up of the same material and are of the same cross section. Both beams carry uniformly distributed loads of equal intensities. One beam is 2 m long and the other is 4 m long. The 2 m long beam shows a central deflection of 1 mm. What is the central deflection of the 4m long beam?

1. 16 mm
2. 2 mm
3. 8 mm
4. 1 mm

Correct Option - 1

Que. 46 When the ratio of the long to short dimension of the slab is greater than X, the slab shall be designed as one-way slab, where X is

1. 1.1
2. 1.5
3. 1.8
4. 2.0

Correct Option - 4

Que. 47 A reinforced concrete cantilever porch has thickness t. The main reinforcement steel will be placed:

1. At mid-thickness.
2. At t/3 from the top.

3. Close to the bottom surface.
4. Close to the top surface.

Correct Option - 4

Que. 48 A purely cohesive soil was tested by unconfined compression test. The mean unconfined compression strength was obtained as 50 kN/ sq.m. The net ultimate bearing capacity of the soil adopting terzaghi's concept will be (adopt bearing capacity factor = 5.7, 1 kg approximately equal to 10 N).

1. 90 kN/sq.m
2. 120 kN/ sq.m
3. 142.50 kN/sq.m
4. 162.50 kN/ sq.m

Correct Option - 3

Que. 49 Web buckling occurs in a beam due to excessive

1. Direct tensile stress in the web
2. Bending tensile stress in the web
3. Torsional shear stress in the web
4. Compressive stress in the web

Correct Option - 4

Que. 50 In an isolated reinforced concrete footing of effective depth d , the stress in punching shear is checked

1. at the centre of the column
2. at the face of the column
3. at a distance $d/2$ away from the face of the column
4. at a distance $d/2$ away from the centre of the column

Correct Option - 3

Que. 51 An ISJC 200 channel section has the following details: width of flange 70 mm, depth of channel 200 mm, the thickness of flange $t_f = 7.1$ mm, a moment of inertia $I_{xx} = 1161.2 \text{ cm}^4$: The distance of shear centre from the centre of the web will be

1. 16.82 mm
2. 18.58 mm
3. 22.87 mm
4. 27.87 mm

Correct Option - 4

Que. 52 Relative humidity is

1. Something concerned with air conditioning
2. The ratio of moisture present in air to the capability of air to hold maximum moisture
3. The ratio of actual humidity to absolute humidity
4. Representative of amount of moisture held in air

Correct Option - 2

Que. 53

As per the Indian Standard specification for drinking water (IS 10500 : 2012), what is the maximum acceptable limit of Fluoride (as F), in mg/l

1. 0.03
2. 0.70
3. 1.00
4. 30

Correct Option - 3

Que. 54 A trapezoidal channel with base of 6 m and side slope of two horizontal to one vertical conveys water at $17 \text{ m}^3/\text{sec}$ with a depth of 1.5 m. The flow situation in the channel is:

1. Critical
2. Supercritical
3. Subcritical
4. None of the above

Correct Option - 3

Que. 55 Consider the following statement associated with critical path:

1. Critical path is the most important sequence of activities which has no float and which determine the project completion period
2. Critical path is the largest path with shortest duration within which the project can be completed
3. The difference between early start time and late finish time must be equal to the activity duration
4. Cannot pass through dummy activity

Which is among the above are correct statements?

1. 1, 2 and 4
2. 1, 3 and 4
3. 1, 2 and 3
4. 1, 2, 3 and 4

Correct Option - 3

Que. 56 Peak Gust wind speed as per IS 875 (Part 3) - 2015, for design loads is defined as:

1. Wind speed associated with maximum wave length
2. Wind speed associated with maximum frequency and velocity
3. Wind speed associated with maximum amplitude
4. Wind speed associated with maximum amplitude and wave length

Correct Option - 3

Que. 57 As per IS 875 (part 3): 2015, while considering the wind load acting in the direction normal to the individual structural element or cladding unit, the following is not considered

1. Material density coefficient
2. Internal and external pressure coefficients
3. Surface area
4. Design wind pressure

Correct Option - 1

Que. 58

As per Indian Standards, linear dynamic analysis shall be performed to obtain the design lateral force for all buildings other than:

1. Rectangular buildings lower than 15 m in seismic zone I
2. Regular building lower than 15 m in seismic zone II
3. Regular building lower than 10 m in seismic zone II
4. Rectangular buildings lower than 10 m in seismic zone I

Correct Option - 2

Que. 59 A tube of aluminium of 40 mm external diameter and 20 mm internal diameter is snugly fitted on a solid steel rod of 20 mm diameter. The composite bar is subjected to an axial compressive force P. If the stress on steel bar is 70 N/mm^2 , the stress in the aluminium tube and corresponding value of P will be: (E for steel: $2 \times 10^5 \text{ N/mm}^2$ and E for aluminium $7 \times 10^4 \text{ N/mm}^2$)

1. 24.5 N/mm^2 , 45.08 kN
2. 36.5 N/mm^2 , 60.10 kN
3. 54.5 N/mm^2 , 73.10 kN
4. 73.80 N/mm^2 , 92.60 kN

Correct Option - 1

Que. 60 A timber beam of rectangular section of length 8 m is simply supported. The beam carries a uniformly distributed load of 12 kN/m, over the entire length and a point load of 10 kN at 3 m from the left support. If the depth is two times the width and stress in the timber is not to exceed 10 N/mm^2 , what is the suitable depth of the section?

1. 412 mm
2. 512 mm
3. 612 mm
4. 712 mm

Correct Option - 2

Que. 61 The ruling gradient in a hill road is 6% and a horizontal curve is provided for a radius of 75 meters. The compensated gradient of the road will be

1. 3%
2. 4%
3. 5%
4. 6%

Correct Option - 3

Que. 62 If the average sewage from a city is $95 \times 10^6 \text{ l/day}$ and the average five-day BOD is 300 mg/l, the population equivalent of the city is: (assume 5 day BOD percapita at $20^\circ\text{C} = 0.075 \text{ kg/day}$)

1. 2,10,000
2. 3,80,000
3. 5,10,000
4. 6,25,000

Correct Option - 2

Que. 63

A pipe 1500 m long and 200 mm in diameter is laid at a slope of 1 in 200 for the first half length and a slope of 1 in 100 for the second half length. The pressure at the upper and lower ends are respectively 1 kg/cm^2 (98.1 kN/m^2) and 0.5 kg/cm^2 (49.05 kN/m^2). If coefficient of friction $f = 0.04$, the discharge in cum/sec will be

1. 0.0324
2. 0.0415
3. 0.0489
4. 0.0521

Correct Option - 1

Que. 64 In an unconfined compression test, a sample clay 100 mm long and 50 mm in diameter fails under a load of 150 N at 10% strain. What is the shearing resistance taking into account the effect of change in cross-section of the sample?

1. 0.068 N/mm^2
2. 0.088 N/mm^2
3. 0.034 N/mm^2
4. 0.044 N/mm^2

Correct Option - 1

Que. 65 The density of a fully saturated specimen of clay having a water content of 40% is 1.88 gm/cc . On oven drying, the density drops to 1.74 gm/cc . The shrinkage limit of the specimen will be (adopt $\gamma_w = 1.0 \text{ gm/cc}$)

1. 13.12%
2. 16.18%
3. 22.99%
4. 26.88%

Correct Option - 3

Que. 66 A camera equipped with a 152 mm focal length lens is used to take a vertical photograph from a flying height of 2780 m above mean sea level. If the terrain is flat and located at an elevation of 500 m, the scale of the photograph will be

1. 1 : 15000
2. 1 : 20000
3. 1 : 22000
4. 1 : 24500

Correct Option - 1

Que. 67 Rain fall intensities in mm/hr at half an hour interval during a 4-hour storm were: 5, 9, 20, 13, 6, 8, 16 and 3 mm/hr. If the corresponding observed runoff is 27.45 million m^3 from a basin having an area of 1830 Km^2 ? The ϕ -index for storm is

1. 6.25 mm/hr
2. 6.7 mm/hr
3. 7.2 mm/hr
4. 7 mm/hr

Correct Option - 3

Que. 68 An activated sludge tank is 30 m in long 9 m wide and has liquid depth of 4 m. The influent sewage flow rate is 3.5 MLD. The primary effluent has BOD of 130 mg/l and suspended load of 15 mg/l. The MLSS concentration in the aeration tank is 1800 mg/l. The Corresponding F/M ratio is

1. 0.19
2. 0.23
3. 0.32
4. 0.46

Correct Option - 2

Que. 69 As per IS 456-2000, deformed bars may be used without end anchorage provided

1. Minimum spacing between the adjacent rod is ensured
2. Sufficient cover is provided to the reinforcement bars
3. Development length required is satisfied
4. None of the above

Correct Option - 3

Que. 70 A propped cantilever beam of length L is subjected to a moment M at the propped end. The support moment at the fixed end will be

1. M
2. M/2
3. M/3
4. 2M

Correct Option - 2

Que. 71 Consider a 3×3 real symmetric matrix A such that the two of its Eigen values are $a \neq 0$ and $b \neq 0$

with respective Eigen vectors $\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$, $\begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix}$. If $a \neq b$, then $x_1 y_1 + x_2 y_2 + x_3 y_3$ equals

1. a
2. b
3. ab
4. 0

Correct Option - 4

Que. 72 The area enclosed between the straight line $y = x$ and the parabola $y = x^2$ in the $x - y$ plane is _____

1. 1/6
2. 1/4
3. 1/3
4. 1/2

Correct Option - 1

Que. 73 The right circular cone of largest volume that can be enclosed by a sphere of 1 m radius a height of

1. 1/3 m
2. 2/3 m

3. 11/3 m
4. 4/3 m

Correct Option - 4

Que. 74 Consider the function $f(x) = 2x^3 - 3x^2$ in the domain $[-1, 2]$. The global minimum of $f(x)$ is:

1. -5
2. 0
3. -1
4. -7

Correct Option - 1

Que. 75 The solution of $x \frac{dy}{dx} + y = x^4$ with the condition $y(1) = \frac{6}{5}$ is

1. $y = \frac{x^4}{5} + \frac{1}{x}$
2. $y = \frac{4x^4}{5} + \frac{4}{5x}$
3. $y = \frac{x^4}{5} + 1$
4. $y = \frac{x^5}{5}$

Correct Option - 1

Que. 76 The inverse Laplace transform of the function $F(s) = \frac{1}{s(s+1)}$ is given by

1. $f(t) = \sin t$
2. $f(t) = e^{-t} \sin t$
3. $f(t) = e^{-t}$
4. $f(t) = 1 - e^{-t}$

Correct Option - 4

Que. 77 Laplace transform of $\cos(\omega t)$ is $\frac{s}{s^2 + \omega^2}$. The laplace transform of $e^{-2t} \cos(4t)$ is

1. $\frac{s-2}{(s-2)^2 + 16}$
2. $\frac{s+2}{(s-2)^2 + 16}$
3. $\frac{s-2}{(s+2)^2 + 16}$
4. $\frac{s+2}{(s+2)^2 + 16}$

Correct Option - 4

Que. 78 A box contains 2 washers, 3 nuts and 4 bolts. Items are drawn from the box at random one at a time without replacement. The probability of drawing 2 washers first followed by 3 nuts and subsequently the 4 bolts is

1. 2/315
2. 1/630
3. 1/1260
4. 1/2520

Correct Option - 3

Que. 79 Consider an unbiased cubic dice with opposite faces coloured identically and each face coloured red, blue or green such that each colour appears only two times on the dice. If the dice is thrown thrice, the probability of obtaining red colour on top face of the dice at least twice is _____

1. $\frac{7}{27}$
2. $\frac{10}{127}$
3. $\frac{19}{27}$
4. $\frac{1}{3}$

Correct Option - 1

Que. 80 The argument of the complex number $\frac{1+i}{1-i}$, where $i = \sqrt{-1}$, is

1. π
2. $-\frac{\pi}{2}$
3. $\frac{\pi}{2}$
4. 2π

Correct Option - 3

