

# SSC - JE MODEL PAPER CIVIL ENGINEERING



# 01. The ability of a material to absorb energy till the 06. T

- breaking or rupture takes place is known as (a) hardness (b) toughness
- (c) brittleness
- (d) softness
- 02. Of the several prismatic beams of equal lengths and of same material, the beam that can carry maximum load in flexure is the one having maximum(a) depth of section (b) area of cross-section
  - (c) section modulus (d) moment of inertia
- 03. The slenderness ratio of a column is zero when its length:
  - (a) effective length is equal to actual length
  - (b) is very large
  - (c) is equal to its radius of gyration
  - (d) is supported on all sides throughout its length
- 04. If the depth of a beam is doubled, the maximum deflection for a given loading will be
  (a) halved
  (b) doubled
  (c) reduced by 4
  (d) reduced to 1/8
- 05. An elastic bar of length 'L', cross-sectional area A, Young's modulus of elasticity E and self-weight W is hanging vertically. It is subjected to a load P applied axially at the bottom end. The total
  - (a)  $\frac{WL}{AE} + \frac{PL}{AE}$  (b)  $\frac{WL}{2AE} + \frac{PL}{AE}$

elongation of the bar is given by

(c)  $\frac{WL}{2AE} + \frac{PL}{2AE}$  (d)  $\frac{WL}{AE} + \frac{PL}{2AE}$ 

- 06. The change in shearing force between two points on the beam is equal to the area of
  - (a) Loading diagram between the two points
  - (b) Shear force diagram between the two points
  - (c) Bending moment diagram between the two points
  - (d) M/EI diagram between the two points
- 07. The ratio of the strength of a solid shaft and hollow shaft of the same external diameter and internal diameter is half of the external diameter is (a) 0.94 (b) 1.02 (c) 1.07 (d) 0.53
- 08. Oleic acid may be used in the manufacture of:
  - (a) White cement
  - (b) Hydrophobic cement
  - (c) Anti-bacterial cement
  - (d) Portland pozzolana cement
- 09. The compressive strength of ordinary Portland cement after 3 days should not be less than :
  - (a)  $50 \text{ kg/cm}^2$  (b)  $100 \text{ kg/cm}^2$ (c)  $130 \text{ kg/cm}^2$  (d)  $160 \text{ kg/cm}^2$
- 10. Out of the constituents of cement namely, tricalcium silicate ( $C_3S$ ), dicalcium silicate ( $C_2S$ ), tricalcium aluminate ( $C_3A$ ) and tertracalcium alumino ferrite ( $C_4AF$ ), the first to set and harden is (a)  $C_2A$  (b)  $C_4AF$  (c)  $C_2S$  (d)  $C_2S$
- 11. The early high strength of rapid hardening cement is due to its
  - (a) increased content of gypsum
  - (b) burning at high temperature
  - (c) increased content of cement
  - (d) higher content of tricalcium silicate

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12.	The fineness of cement can be found out by sieve
	analysis using IS sieve number

(a) 20 (b) 10 (c) 9 (d) 6

- 13. Fineness test of cement gives us an estimate of(a) workability of concrete(b) heat of hydration
  - (c) rate of hydration
  - (d) durability of concrete
- 14. The fineness modulus of fine aggregate is:
  (a) 2.0 to 3.5
  (b) 3.5 to 5.0
  (c) 5.0 to 7.0
  (d) 6.0 to 8.5
- 15. A heavy stone is suitable for the construction of
  (a) Arches
  (b) Rubble masonry
  (c) Roads
  (d) Retaining walls
- 16. Plywood is manufactured from
  (a) bamboo
  (b) teak wood
  (c) waste wood
  (d) structural timber
- 17. Bitumen of grade 100/120 means
  - (a) Its compressive strength is 100 to 120 kPa
  - (b) Its tensile strength is 100 to 120 kPa
  - (c) Its penetration value is 10 to 12 mm
  - (d) Both compressive and tensile strength is 100 to 120 kPa
- 18. The vehicle used in case of enamel paints is usually
  (a) kerosene
  (b) varnish
  (c) water
  (d) none of above
- 19. The split tensile strength of M15 grade concrete when expressed as a percentage of its compressive strength is:

# (a) 10 to 15% (b) 15 to 20% (c) 20 to 25 % (d) 25 to 30% 20. The approximate ratio between the strengths of cement concrete at 7 days and 28 days is: (a) 3/4 (b) 2/3 (c) 1/2 (d) 1/3 21. Which of the following constituents when present in excess quantity in clay causes bricks to melt and distort during burning?

(a) Alumina (c) Lime (d) Alkali

(c) 12 percent

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- 22. The weight of timber is specified, as per the Indian standards, at a moisture content of
  - (a) 8 percent (b) 10 percent
    - (d) 14 percent
- 23. The estimated quantity of cement required per m<sup>3</sup> in a compacted cement concrete of 1 : 2 : 4 : nominal mix is
- (a) 315 kg (b) 330 kg (c) 285 kg (d) 255 kg
- 24. Cross sectional area at one end of earthwork is 8 sq. m. and at other end of it is 10 Sq. m, if distance between two end sections is 6m. Area of mid section is 8.5 Sq. m., then volume of earthwork using Prismoidal formula will be
  (a) 49 Cu m

(a) 49 Cu. m.	(b) 31.3 Cu. m
(c) 50.5 Cu. m	(d) 52 Cu. m.

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- 25. The edging work made of brickwork is measured in
  - (a) Cub m (b) Sq m (c) Metres (d) None of these
- While submitting a tender, the contractor is required 26. to deposit some amount with the department, as guarantee of the tender, known as:
  - (a) Bank Guarantee (b) EMD
  - (c) S.D (d) F.D
- 27. Salvage value is defined as:
  - (a) value of dismantled materials of a property at the end of its utility period
  - (b) estimated value of a built up property at the end of its useful life without being dismantled
  - (c) value of the property shown in the account book in that particular year
  - (d) present value of a property considering it to be replaced at the current market rates
- 28. Periodical payment for repayment of capital amount invested in a property for a specific period is called as
  - (b) Annuity (a) Revolution (c) Sinking fund (d) Depreciation
- 29. The plan of a building is in the form of square with centre line dimensions of outer walls as 15.7 m  $\times$  15.7 m. If the thickness of the wall in superstructure is 0.30 m, then its plinth area is: (a)  $234 \text{ m}^2$ (b)  $250 \text{ m}^2$ 
  - (c)  $216 \text{ m}^2$ (d)  $256 \text{ m}^2$

- 30. The correct prismoidal formula for volume calculation is:
  - (a)  $\frac{D}{6}$  [First section area + last section area +  $2\Sigma$  even numbered section area +  $4\Sigma$  odd numbered section area
  - (b) D [first section area + last section area +  $\Sigma$  even numbered section area + 2 $\Sigma$  odd numbered section areas]
  - (c)  $\frac{D}{3}$  [First section area + last section area +  $4\Sigma$  (even numbered section area) +  $2\Sigma$  (odd numbered section areas)]
  - (d)  $\frac{D}{3}$  [first section area + last section area +  $2\Sigma$  even numbered section area +  $4\Sigma$  odd numbered section areas]
- 31. The total length of a cranked bar through a distance (d) at 45° in case of a beam of effective length L, and depth (d) is (a) L + 0.42d(b)  $L + 2 \times 0.42d$ (d)  $L - 2 \times 0.42d$
- 32. The volume of the cement required for  $10 \text{ m}^3$  of brickwork in 1:6 cement mortar is approximately equal to

(a) 
$$\frac{3}{7}$$
 m<sup>3</sup>  
(b)  $\frac{3}{6}$  m<sup>3</sup>  
(c)  $\frac{3}{4}$  m<sup>3</sup>  
(d)  $\frac{3}{5}$  m<sup>3</sup>

(c) L = 0.42d

33. Newtonian fluids satisfy which of the following equations?

(a) 
$$\tau = \mu \left(\frac{du}{dy}\right)^2$$
 (b)  $\tau = \tau_c + \mu \left(\frac{du}{dy}\right)$   
(c)  $\tau = \mu \frac{du}{dy}$  (d)  $\tau = \tau_c + \mu \left(\frac{du}{dy}\right)^2$ 

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34. The pressure in meters of oil (specific gravity 0.85) equivalent to 42.5 m of water is

a) 42.5 m	(b) 50 m
c) 52.5 m	(d) 85 m

- 35. Which of the following device works on the principle that "If the velocity of flow at a point becomes zero, the pressure there is increased due to the conversion of the kinetic energy into pressure energy?"
  - (a) Venturimeter
  - (b) Orifice meter
  - (c) Pitot Tube
  - (d) Both Venturimeter and orifice meter
- 36. The line representing the sum of pressure head and datum head with respect to some reference line is called

(a) H.G.L.	(b) T.E.L.
(c) H.G.L. + T.E.L.	(d) T.E.L H.G.L

- 37. Depth at which specific energy is minimum is known as
  - (a) Critical depth(b) Conjugate depth(c) Alternate depth(d) Normal depth
- 38. Water is to be pumped at a rate of 6.0 cubic metres per minute to a height of 12.0 m; if the head loss is estimated as 5.0 m, the minimum rating of the pump required is

(a) 1.70 kW	(b) 17.0 kW
(c) 170.0 kW	(d) 12.5 kW

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- 39. Negative slip may occur in a reciprocating pump when
  - (a) the suction pipe is too short
  - (b) the delivery head is too high
  - (c) the discharge is too small
  - (d) the speed is too high
- 40. The water surface profile resulting from flow underneath the gate in the figure is



(a)  $H_3$  (b)  $M_1$  (c)  $H_2$ 

(d)  $S_2$ 

- 41. Hydraulic jump occurs when
  - (a) Flow is Sub-critical
  - (b) Flow is Super-Critical
  - (c) Flow is Sub-Critical and adequate down stream depth is available
  - (d) Flow is Super-Critical and adequate down stream depth is available

42. According to IS 456-2000, the maximum strain in concrete at the outermost compression fibre in the limit state design of flexural members is

(a) 0.0020 (b) 0.0035 (c) 0.0050 (d) 0.0065

43. The maximum area of tension reinforcement in a rectangular beam of size (b × d) shall not exceed
(a) 0.4 bD
(b) 0.2 bD
(c) 0.04 bD
(d) 0.02 bD

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# Upcoming Batches @ HYDERABAD

		GATE + PS	SUs - 2021		
Sp	ark Batches		10 <sup>th</sup> May, 8 <sup>th</sup> & 23 <sup>rd</sup> June 2020.		
Reg	gular Batches		26 <sup>th</sup> April, 10 <sup>th</sup> , 24 <sup>th</sup> May, 8 <sup>th</sup> , 23 <sup>rd</sup> June, 7 <sup>th</sup> , 22 <sup>rd</sup> July, 5 <sup>th</sup> & 20 <sup>th</sup> August 2020.		
		ESE + GATE +	- PSUs - 2021		
Sp	ark Batches		10 <sup>th</sup> May, 8 <sup>th</sup> & 23 <sup>rd</sup> .	June 2020.	
Reg	gular Batches	29 <sup>th</sup> March, 26 <sup>th</sup> April, 10 <sup>th</sup> , 24 <sup>th</sup> May, 8 <sup>th</sup> , 23 <sup>rd</sup> June & 7 <sup>th</sup> July 2020			
Upcomin	Upcoming Batches @ DELHI			ng Batches @ PUNE	
GATE + PSUs - 2	GATE + PSUs - 2021 & ESE + GATE + PSUs - 2021		GATE + PSUs - 2	2021 & ESE + GATE + PSUs - 2021	
<b>Regular Batches</b>	Regular Batches 21" March, 10" & 20" May 2020.		Regular Batches	1 <sup>st</sup> & 15 <sup>th</sup> June, 6 <sup>th</sup> July 2020.	
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44. If 'K' is the neutral axis constant for a singly reinforced member, the lever arm constant is given by

(a) 
$$1 - \frac{K}{3}$$
 (b)  $1 + \frac{K}{3}$   
(c)  $1 - \frac{K}{6}$  (d)  $1 - \frac{K}{9}$ 

- 45. One of the criteria for the effective width flange of T-beam is
  - $b_{\rm f} = \frac{\ell_{\rm o}}{6} + b_{\rm w} + 6D_{\rm f}$

In the above formula, lo signifies

- (a) Effective span of T-beam
- (b) distance between points of zero moments in the beam
- (c) clear span of the beam
- (d) distance between point of maximum moments in the beam.
- 46. Limit state of serviceability for deflection including the effects due to creep, shrinkage and temperature occurring after erection of partitions and application of finishes as applicable to floors and roofs is restricted

(a) 
$$\frac{\text{Span}}{150}$$
 (b)  $\frac{\text{Span}}{200}$   
(c)  $\frac{\text{Span}}{250}$  (d)  $\frac{\text{Span}}{350}$ 

47. The diameter of main reinforcing bars in a reinforced concrete slab shall not exceed x-times the total thickness of slab, where x is equal to

(a) 
$$\frac{1}{4}$$
 (b)  $\frac{1}{8}$   
(c)  $\frac{1}{12}$  (d)  $\frac{1}{16}$ 

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- 48. Side face reinforcement is provided in a beam when the depth of web exceeds
  - (a) 300 mm (b) 450 mm
  - (c) 500 mm (d) 750 mm
- 49. The minimum thickness of R. C. C. wall should not be less than
  - (a) 100 mm (b) 50 mm (c) 75 mm (d) 150 mm
- 50. The torsional longitudinal reinforcement in RCC beams should be placed at:
  - (a) Each corner of the beam
  - (b) Middle of each face
  - (c) Middle of the beam
  - (d) Core of the beam
- 51. In the case of a tension member consisting of two angles back to back on the same side of gusset plate, what is K equal to? (Area of connected leg =  $A_1$ , Area of outstanding leg =  $A_2$ )

(a) 
$$\frac{3A_1}{3A_1 + A_2}$$
 (b)  $\frac{3A_1}{A_1 + 3A_2}$   
(c)  $\frac{5A_1}{A_1 + 5A_2}$  (d)  $\frac{5A_1}{5A_1 + A_2}$ 

- 52. As per Indian Standards rolled steel I-sections are classified into
  - (a) four series(b) five series(c) six series(d) seven series
- 53. Four vertical columns of the same material, height and weight have the same end conditions. The buckling load will be the largest for a column having the cross-section of
  - (a) solid square(b) thin hollow circle(c) solid circle(d) H-section

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54.	Ringlemann's scale (a) measures CO (b) measures SO <sub>2</sub> (c) grades density of smoke (d) grades automobile exhaust		60.	<ul> <li>Which of the following conditions?</li> <li>(a) Sludge digestion Tank</li> <li>(b) Activated sludge treat</li> <li>(c) Sedimentation tank</li> </ul>	unit works in anaerobic
55.	The type of lakes in which a perfect ecological equilibrium among the producer, decomposer and consumer groups of organism exist is: (a) Senescent lakes (b) Mestrophic lakes (c) Oligotrophic lakes (d) Eutrophic lakes		61.	<ul> <li>(d) Frickling filters</li> <li>As per Central Pollution</li> <li>Air Quality Index for sat</li> <li>the range of:</li> <li>(a) 301 to 400</li> <li>(c) 101 to 200</li> </ul>	Control Board (CPCB) tisfactory condition is in (b) 201 to 300 (d) 51 to 100
56.	Potassium dichromate is v (a) reducing agent (c) indicator	used in COD test as (b) oxidizing agent (d) none of these	1NG 62.	Conjunctive use of water (a) the sum of evapo-tran of water used up in r	in a basin means nspiration and the amount
57.	In DO test, if no oxygen is ions react with hydroxide Mn $(OH)_2$ . Its colour is (a) Brown (c) Red	s present, the Manganous to form a precipitate of (b) White (d) Black		<ul> <li>(b) combined use of surresources</li> <li>(c) combined use of v hydropower generation</li> <li>(d) the sum of evapo-translosses.</li> </ul>	water for irrigation and ion nspiration and infiltration
58.	As per Buston's formula, of 100000, fire demand w (a) 31820 litres/minute (b) 11360 litres/minute (c) 46370 litres/minute (d) 56630 litres/minute	, for a city of population ill be Since	63. 64.	Irrigation canals are gene (a) ridge line (c) valley line Most commonly used sect is	erally aligned along (b) contour line (d) straight line tion in the grade aqueduct
59.	<ul><li>Which of the salt present cultivation purposes?</li><li>(a) Sodium carbonate</li><li>(b) Potassium sulphate</li><li>(c) Calcium sulphate</li><li>(d) none of these</li></ul>	t in water is harmful for	65.	<ul><li>(a) Circular</li><li>(c) Parabolic</li><li>The free board in a reserv</li><li>(a) size of the reservoir</li><li>(c) wind velocity</li></ul>	<ul> <li>(b) rectangular</li> <li>(d) All of these</li> <li>voir is governed by</li> <li>(b) runoff</li> <li>(d) All of these</li> </ul>

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- 66. Spur is a structure used for
  - (a) Protecting the banks of rivers and canals
  - (b) extracting sediment from flow
  - (c) diverting flow of water to canal
  - (d) none of these
- 67. The relationship between specific gravity of soil (S), Field capacity (FC) and Permanent wilting point (PWP) exists to compute available water for plant per meter depth is

(a) AW = S[FC - PWP]

- (b) AW = S[PWP FC]
- (c) Relationship does not exist
- (d) AW = S FC PWP

68.	The water is unsuitable for irrigation when the	
	boron content exceeds the limit of	

- (a) 0.5 ppm (b) 1 ppm (c) 1.5 ppm (d) 2 ppm
- 69. For irrigation, water having SAR above 26
  - (a) Can be used for all soils if some precautions are taken
  - (b) Can be used for all soils and for all crops
  - (c) Can be used for all soils except fine textured soils
  - (d) Is not used for any irrigation
- 70. Bulking of sand occurs due to:

(a) Viscosity	(b) Capillarity action
(c) Moisture in voids	(d) Surface tension

- 71. A fine grained soil has liquid limit of 60 and plastic limit of 20. As per plasticity chart, according to IS classification, the soil is represented by the letter symbols
  - (a) CL (b) CI (c) CH (d) CL-ML

- 72. Which of the following statement is true?
  - (a) In a dry soil, all the voids are filled with air
  - (b) In a saturated soil, all the voids are filled with water
  - (c) In a partly saturated soil, the voids are occupied by both air and water
  - (d) All the above
- 73. The law of flow of water through soil mass was studied firstly by
  - (a) Hook (b) Darcy (c) Stoke
    - (d) All of these
- 74. The capillary potential of a soil particle is always (b) Positive (a) Negative (c) Zero (d) 1
- 75. If there are 10 concentric circle & 50 radius lines in newmark's influence chart for stress distributing then, what will be the value of influence factor of chart?

(a) 0.002 (b) 0.2(c) 2(d) 20

- 76. Method of slices for determining stability of slope was first suggested by
  - (b) Bishop (a) Taylor (c) Fellenius (d) Terzaghi
- 77. The minimum centre to centre spacing of friction piles of diameter D as per Bureau of Indian Standards is

(a) 2.5 D	(b) 3 D
(c) 3.5 D	(d) 4.0 D

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Batch Type	Timings	Batch Date	Duration	Venue & Streams	
		28 <sup>th</sup> April 2020		ABIDS (CS&IT)	
Short Term	Full Day Classes	05 <sup>th</sup> ,10 <sup>th</sup> ,17 <sup>th</sup> , 25 <sup>th</sup> May 2020	55 to 60 Days	DILSUKHNAGAR (EE, ME, PI) KUKATPALLY	
		01 <sup>st</sup> & 08 <sup>th</sup> June 2020		(EC, CE, INST)	
	GA	TE + PSUs - 2021 (Regula	ar Batches)		
Batch Type	Timings	Batch Date	Duration	Venue & Streams	
		26 <sup>th</sup> April 2020			
		10 <sup>th</sup> & 24 <sup>th</sup> May 2020	5 to 6		
		08 <sup>th</sup> & 23 <sup>rd</sup> June 2020	Months	ABIDS (CS&II)	
		07 <sup>th</sup> & 22 <sup>nd</sup> July 2020			
	Della	26 <sup>th</sup> April 2020			
Regular	4 to 6	10 <sup>th</sup> & 24 <sup>th</sup> May 2020		DILSUKHNAGAR (EC, EE, INST, ME, PI) KOTHAPET (CE) KUKATPALLY, (EC, EE, ME, CE)	
	Hours	08 <sup>th</sup> & 23 <sup>rd</sup> June 2020	5 to 6 Months		
		07 <sup>th</sup> & 22 <sup>nd</sup> July 2020			
		05 <sup>th</sup> & 20 <sup>th</sup> August 2020			
		17 <sup>th</sup> May 2020			
		01 <sup>st</sup> & 15 <sup>th</sup> June 2020	Months		
	G/	ATE + PSUs - 2021 (Sparl	k Batches)		
Batch Type	Timings	Batch Date	Duration	Venue & Streams	
	Daily	10 <sup>th</sup> May 2020,	5 to 6	ABIDS (EC, EE, ME,	
Spark	4 to 6 Hours	08 <sup>th</sup> & 23 <sup>rd</sup> June 2020	Months	CE, CS & IT)	
	ESE +	GATE + PSUs - 2021 Reg	gular Batche	5	
Batch Type	Timings	Batch Date	Duration	Venue & Streams	
		29 <sup>th</sup> March 2020			
	Daily	26 <sup>m</sup> April 2020	9 to 10 Months	ABIDS (EE, EC)	
Regular	6 to 8	10" & 24" May 2020		KOTHADET (OF ME)	
	HOUIS	08 <sup>th</sup> & 23 <sup>rd</sup> June 2020			
DIT	ESE	+ GATE + PSUS - 2021 Sp	ark Batches		
Batch Type	limings	Batch Date	Duration	Venue & Streams	
Spark	Daily 6 to 8 Hours	10 <sup>™</sup> May 2020,	9 to 10 Months	ABIDS (EC, EE, ME, CE)	

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 For a saturated clayey soil, Skempton's Pore pressure parameter 'B' is

(a) 0.1 (b) 0.5 (c) 1.0 (d) 2.0

- 79. Which of the following conditions is not favourable for construction of a Tunnel?
  - (a) Tunnels parallel to the strike with beds dip in the tunnel
  - (b) Tunnel parallel to the dip direction
  - (c) Small sized tunnel in massive thick horizontal layers normal to the tunnel direction.
  - (d) Tunnels in Hard, Crystalline, Massive rocks.
- 80. A 4-hour rainfall in a catchment of 250 km<sup>2</sup> produces rainfall depths of 6.2 cm and 5.0 cm in successive 2-hour unit periods. Assuming the  $\phi$ -index of the soil to be 1.2 cm /hour, the run-off volume in ha-m will be
  - (a) 16 (b) 22 (c) 1600 (d) 2200
- 81. The rate of flow of water through a vertical strip of aquifer of unit width and extending the full saturation height under unit hydraulic gradient is known as
  - (a) Coefficient of permeability
  - (b) storage coefficient
  - (c) specific retention
  - (d) coefficient of transmissibility
- 82. The maximum permissible limits for super elevation and lateral friction as per IRC in a National Highway in hilly terrain

  (a) 0.1, 0.15
  (b) 0.07, 0.15
  (c) 0.07, 0.35
  (d) 0.1, 0.35

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- 83. The compensated gradient for a hilly region having a ruling gradient of 5% with a horizontal curve having a radius of 80 m is
  - (a) 1.375% (b) 3.625% (c) 0.9575% (d) 4.0625%
- 84. A traffic rotary is justified where
  - (a) number of intersecting road is between 4 and 7
  - (b) space is limited and costly
    - (c) when traffic volume is less than 500 vehicle per hour
  - (d) when traffic volume is more than 5000 vehicle per hour
- 85. The IRC has fixed the maximum limit of super elevation for the plain and rolling terrains and snow bound areas as \_\_\_\_\_ percent under mixed traffic conditions.
  (a) 15 (b) 7 (c) 0.07 (d) 30
- 86. Bituminous material are commonly used in highway construction because of their good:
- (a) Tensile and compression properties
  - (b) Binding and waterproofing properties
  - (c) Shear strength and tensile properties
  - (d) Bond and tensile properties
- 87. Which one of the following correctly represent the specification of "STOP" regulatory sign?
  - (a) Octagonal shape, red in colour with white border
  - (b) Hexagonal shape red in colour with white border
  - (c) Octagonal shape white in colour with red border
  - (d) Hexagonal shape, white in colour with red border

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- 88. Which one of the following is the critical combination of stresses for interior and edge regions in a cement concrete pavement during summer mid-day?
  - (a) Load stress Warping stress Frictional tress
  - (b) Load stress Warping stress + Frictional tress
  - (c) Load stress +Warping stress + Frictional tress
  - (d) Load stress + Warping stress Frictional tress

89. Railway tracks are banked on curves\_

- (a) to obtain necessary centrifugal force from the horizontal component of the weight of the train.
- (b) to avoid frictional force between the tracks and wheels
- (c) to obtain necessary centripetal force from the horizontal component of the weight of the train
- (d) so that the train many not fly off in the opposite direction

90. Flange way clearance is the distance

- (a) between the adjoining faces of the running rail and the check rail near the crossing
- (b) between the gauge faces of the stock rail and the tongue rail
- (c) through which the tongue rail moves laterally at the toe of the switch
- (d) None of the above
- 91. The needle used in a surveyor's compass is
  - (a) Broad type (b) Bar type
  - (c) Edge bar type (d) None of the above

- 92. In a traverse survey, closing error means
  - (a) the error in the closing of the traversing operation
  - (b) the actual distance by which the traverse fails to close
  - (c) the distance between the starting and end point of an open traverse.
  - (d) the bearings observed are unaffected by local attraction

93. The lines which are connecting main stations to a subsidiary station on opposite side (or) connecting two subsidiary stations on the sides of main lines are?

- (a) Base lines(b) Check lines(c) Tie lines(d) Detail lines
- 94. To observe the included angle accurately, method preferred is
  - (b) reiteration
  - (c) by deflection angles (d) double precision
- 95. Accurate centring in plane table surveys is necessary for
  - (a) small-scale maps

(a) repetition

- (b) large-scale maps
- (c) filling in details
- (d) to solve triangle of error rapidly
- 96. The usual longitudinal overlap in aerial photogrammetry is
  (a) 25%
  (b) 30%
  (c) 50%
  (d) 60%

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- 97. The latitude coordinate relates to
  - (a) North and South
  - (b) North and East
  - (c) North and West
  - (d) East and West
- 98. In a tilted aerial photograph, if the swing is 230°, then the rotation angle is equal to
  - (a) 140°
  - (b) 130°
  - (c) 50°
  - (d) 25°

# 99. Survey is preferred with true meridians because these

- (a) converge at poles
- (b) do not change with time
- (c) facilitate plotting
- (d) are chosen arbitrarily
- 100. When a two hinged parabolic arch is subjected to a rise of temperature, the horizontal thrust at the support will
  - (a) Decrease
  - (b) Remain constant
  - (c) Increase
  - (d) Increase or decrease depending on the span

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**Detailed Solutions** 

# 01. Ans: (b)

**Sol: Toughness:** The ability of material to absorb energy till fracture is toughness.

**Resilence:** The ability of material to absorb energy till elastic limit is resilence.

- 02. Ans: (c)
- Sol: As per bending formula

$$\frac{\sigma}{y} = \frac{M}{I}$$
$$M = \frac{I}{V_{max}} \times \sigma_{max}$$

or  $M = Z \times \sigma_{max}$ Now, maximum permissible stress will remain same for the material

same for the material

So, in order to sustain maximum load.

1.e maximum moment is to be sustain

Hence from above equation

It is clear, if  $Z \uparrow$  then M  $\uparrow$ 

# 03. Ans: (d)

Sol: The slenderness ratio of a column is zero when its length is supported on all sides throughout its length.

# 04. Ans: (d) Sol:

$$y\alpha \frac{1}{1} \text{ and } y\alpha \frac{1}{d^3}$$
  
 $y\alpha \frac{1}{2^3}\alpha \frac{1}{8}$ 

Reduced by 8 times

**05.** Ans: (b) Sol: W = Self weight (tension) P = External load (tensile) Total elongation  $= \frac{WL}{2AE} + \frac{PL}{AE}$ 

Sol: 
$$\frac{dF}{dx} = w$$
  
 $dF = w.dx$ 

Change in SF between any two points equal to area of loading diagram

07. Ans: (c)

**Sol:**  $\frac{(\text{Strength})_{\text{s}}}{(\text{Strength})_{\text{h}}} = \frac{Z}{Z}$ 

$$= \frac{D^4}{D^4 - \left(\frac{D}{2}\right)^4} = \frac{16}{15} = 1.07$$

# 08. Ans: (b)

Sol: Hydrophobic cement is obtained by intergrinding OPC clinkers with 0.1 - 0.4% of water repellant film-forming substances like oleic acid or stearic acid.

# 09. Ans: (d)

**Sol:** As per Table 3 of IS 269-2013, the compressive strength of 33 grade OPC after 3 days should not be less than 160 kg/cm<sup>2</sup>.

# 10. Ans: (c)

**Sol:** Among all the bogue compounds only  $C_3S$  and  $C_2S$  are responsible for hardening of cement. Since the rate of hydration of  $C_3S$  is more than that of  $C_2S$ ,  $C_3S$  is the first of the bogue compounds to set and harden.

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# 11. Ans: (d)

Sol: Rapid hardening cement has more proportion of  $C_3S$  compared to  $C_2S$  and is grounded finer than OPC.

This cement has high rate of early strength gain i.e. 1 day strength of this cement is equal to the 3 day strength of OPC.

# 12. Ans: (c)

Sol: IS sieve no. 9 (90 micron sieve) is used in the sieve method and the residue after sieving should not exceed 10% by weight for ordinary Portland cement.

# 13. Ans: (c)

**Sol**: Fineness test is used to determine the degree of fineness.

And we know, with an increase in degree of fineness, rate of hydration increases and so the rate of early development of strength is increased but the ultimate strength remains the same.

# 14. Ans: (a)

Sol: Classification of sand based on fineness modulus:

Very fine sand	< 2.2
Fine sand	2.2 - 2.6
Medium sand	2.6 - 2.9
Coarse sand	2.9-3.2

Sand comes under fine aggregate and hence fineness modulus of fine aggregate is 2.0-3.5.

# 15. Ans: (d)

**Sol:** A heavy stone is suitable for the construction of Retaining walls and Abutments.

# 16. Ans: (b)

Sol: Plywood is manufactured from teak wood

# 17. Ans: (c)

Sol: Bitumen grade is represented by its penetration value measured in the units of 1/10 th of mm. Therefore bitumen grade of 100/120 means penetration value is in between 100 to 200 units i.e., 10 to 12 mm.

# 18. Ans: (b)

Sol: The vehicle used in case of enamel paints is usually varnish

# 19. Ans: (a)

**Sol:** The split tensile strength of concrete is about 10 to 15% of compressive strength.

# 20. Ans: (b)

**Sol:** The approximate ratio between the strengths of cement concrete at 7 days and 28 days is 2/3.

# 21. Ans: (c)

Sol: Excess Silica makes brick brittle Excess Alumina produces cracks Excess Lime make the brick to melt and loose its shape during burning

# 22. Ans: (c)

**Sol:** The weight of timber Specified as per the Indian standards at a moisture content of 12 percent.

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# 23. Ans: (a)

Sol: Given 1:2:4 cement = 1/7 Volume of wet cement concrete = 1.54 m<sup>3</sup> Volume of 50 kg cement bag = 0.035 m<sup>3</sup> Volume of cement share in concrete  $=\frac{1}{7} \times 1.54 = 0.22 \text{ m}^3$ 

Number of Cement bags =  $\frac{0.22}{0.035}$  = 6.29 bags

Total cement in kg's =  $6.29 \times 50 = 314.3$  kgs

# 24. Ans: (d)

Sol: C/S area (a) one end = 7 sqm =  $A_1$ C/S area (a) other end = 9 sq m =  $A_2$ Distance 'd' = 6 m Area of mid section = 8.5 sqm Volume =  $\frac{d}{6}(A_1 + A_2 + 4Am)$ 

$$=\frac{6}{6}[8+4\times8.5+10]$$

Volume = 52 cum

## 25. Ans: (c)

**Sol:** Edging work made of brickwork is measured in running metres.

## 26. Ans: (b)

**Sol:** EMD (Earnest Money Deposit) is the guarantee given to client for displaying that you are a serious bidder.

## 27. Ans: (b)

**Sol:** Salvage value is property at the end of useful period of built up property.

#### 28. Ans: (b)

**Sol:** Definition of annuity is the amount saved for the repayment of capital amount invested in a property for a specific period.

# 29. Ans: (d)

Sol: Plinth area =  $(15.7 + 0.3) \times (15.7 + 0.3)$ =  $16 \times 16$ =  $256 \text{ m}^2$ 

#### 30. Ans: (c)

**Sol:** If A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub>, ..., A<sub>n</sub> are the areas enclosed in a contour line and if 'D' is the contour interval, the capacity of reservoir can be estimated as i. Trapezoidal formula:

$$V = \frac{D}{2} [(A_1 + A_n) + 2(A_2 + A_3 \dots A_{n-1})]$$

ii. Prismoidal formula:

$$V = \frac{D}{3} \begin{bmatrix} A_1 + A_n + 4(A_2 + A_4 + \dots A_{n-1}) \\ + 2(A_3 + A_5 + \dots A_{n-2}) \end{bmatrix}$$

31. Ans: (b)

**Sol:** Length covered by crack = d/sin45

Hence,

Extra length required at both end = 1.42d - d= 0.42d

= 1.42d

Assuming the bar is cranked at both ends Total length of bar required =  $L + 2 \times 0.42$  d = L + 0.84 d

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32. Ans: (a) Sol: Brickwork For 10 m<sup>3</sup> Number of Bricks in 10 m<sup>3</sup>  $=\frac{10}{0.2 \times 0.1 \times 0.1} = 5000$  no.s Mortar to be used around brick  $= 0.2 \times 0.1 \times 0.1 - 0.19 \times 0.09 \times 0.09$  $= 4.61 \times 10^{-4} \text{ m}^3$ Total mortar required for  $10^3 = 5000 \times 4.61 \times 10^{-4}$  $= 2.305 \text{ m}^3$ For converting to net to dry mortar 30% extra has to be taken Total mortar =  $2.305 \times 1.3$  $= 3 \text{ m}^{3}$ Cement required =  $\frac{3}{7}$ m<sup>3</sup> 33. Ans: (c) 34. Ans: (b) Sol: 42.5 m of water =  $42.5 \times \frac{\rho_w}{\rho_o} = \frac{42.5}{0.85}$ = 50 m of oil35. Ans: (c) Sol: Pitot tube measures dynamic pressure from which velocity can be calculated. Dynamic pressure is a pressure rise obtained when velocity is completely converted into an equivalent pressure. 36. Ans: (a) Sol: Hydraulic Grade Line (HGL) represents variation of piezometric head  $\left(\frac{P}{\rho g} + Z\right)$  along the pipe length with respect to some datum.



The critical depth has a Froude number equal to one and corresponds to the minimum energy a flow can posses for a given discharge.

# 38. Ans: (b)

**Sol:**  $P = \rho.g. Q (H + h_f)$ 

$$= 1000 \times 10 \times \frac{6}{60} \times (12+5)$$

 $= 1000 \times 10 \times 0.1 \times 17 = 17 \text{ kW}$ 

**39.** Ans: (d) **40.** Ans: (a)

41. Ans: (d)

## 42. Ans: (b)

**Sol:** As per IS: 456-2000 the maximum strain in concrete at outermost compression fibre in bending shall be 0.0035.

## 43. Ans: (c)

Sol: Min percentage of reinforcement should be (cl.26.5.1.1)

$$\frac{A_s}{bd} = \frac{0.85}{f_s}$$

Max percentage of reinforcement (both compression and tension steel) should be 4% of cross sectional area of beam (cl.26.5.1.2) i.e. A = 0.04 bD

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# 44. Ans: (a) Sol:



Lever Arm =  $d - \frac{kd}{3}$ Lever Arm Constant = Lever arm

# 45. Ans: (b)

**Sol:** The distance between points of zero moments in the beam

 $=\left(1-\frac{K}{3}\right)$ 

## 46. Ans: (d)

- **Sol:** The final deflection of horizontal members below the level of casting should not exceed **span / 250**.
  - This is based on the reason that the user can't notice the deflection.
  - The deflection taking place after the construction of partitions or application of finishes should not exceed span / 350 or 20mm which ever is less.
  - This limit is to prevent damage to partitions or finishes.

## 47. Ans: (b)

Sol: The maximum dia of bar in RC slab

$$=\frac{1}{8}$$
 × thick of slat

$$\phi = \frac{D}{8}$$

# SSC - JE MODEL PAPER

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# 48. Ans: (d)

**Sol: Side Face Reinforcement:** If depth of the web in a beam exceeds 750 mm, Side face reinforcement should be provided along the two faces. The total area of side face reinforcement is 0.1% web area. It should be equally distributed equally on each of the two face, and spacing of such reinforcement should not exceed 300 mm c/c.

49. Ans: (a)

50. Ans: (a) Sol:



## 51. Ans: (d)

Sol: Single angle connected by one leg only Net effective sectional area of single angle  $A_{net} = A_1 + K_1A_2$ 

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Where,  $A_1 =$  Net sectional area of the connected leg = (x - d - t/2) t

 $A_2$  = Gross cross sectional area of unconnected or outstanding leg

$$= (y - t/2) t$$
  

$$K_1 = \frac{3A_1}{(3A_1 + A_2)} = \frac{1}{1 + 0.33 \frac{A_2}{A_1}}$$

(b) Pair of an angles placed back – to – back connected by one leg of each angle (or by the flange of a Tsection) to the same side of a gusset plate (with tacking rivets)

Net effective sectional area of pair of angles

 $\mathbf{A}_{\text{net}} = \mathbf{A}_1 + \mathbf{K}_2 \times \mathbf{A}_2$ 

 $A_1$  = Net sectionals area of connected legs (or Flange of T section)

 $A_2$  = Gross area of outstanding legs (or web of T section)

$$k_2 = \frac{5A_1}{5A_1 + A_2} = \frac{1}{1 + 0.2\frac{A_2}{A_1}}$$

## 52. Ans: (b)

- Sol: As per Indian Standards rolled steel I-sections are classified into
  ISJB (Indian Standard Junior Beam)
  ISLB (Indian Standard Light Beam)
  ISMB (Indian Standard Medium Beam)
  ISWB (Indian Standard Wide Flange Beam)
  ISHB (Indian Standard Heavy Beam)
- 53. Ans: (b) 54. Ans: (d) 55. Ans: (c)

## 56. Ans: (b)

- **Sol:** Oxidizing agent as potassium dichromate is used in COD test option (b) is correct.
- 57. Ans: (b)

58. Ans: (d) Sol: Buston formula  $Q = 5663\sqrt{P}$  $Q - 1t/min P \rightarrow$  Population in thousand Actual Population = 1,00,000

 $1995P = \frac{100000}{1000} = 100$ 

 $Q = 5663\sqrt{100} = 56630 lt/min.$ 

59. Ans: (d)Sol: All Salts are required.

#### 60. Ans: (a)

**Sol:** Activated sludge and trickling filter are essentially aerobic process

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# 61. Ans: (d) Sol:

AQI	Remark
0 - 50	Good
51 - 100	Satisfactory
101 - 200	Moderate
201 - 300	Poor
301 - 400	Very poor
401 - 500	Severe

# 62. Ans: (b)

**Sol:** Conjunctive use consists of harmoniously combining the use of both surface water and groundwater in order to minimize the undesirable effect and to optimise the water demand.

# 63. Ans: (a)

**Sol:** Watershed canal or ridge canal ensures gravity irrigation on both side of canal. It is used in plains. Contour canals are used in hilly areas be the length of ridge canal will be very high hilly areas. Only one side can be irrigated by contour canal

# 64. Ans: (b)

**Sol:** Rectangular is the section used in aqueducts. Circular & parabolic is seldom used.

# 65. Ans: (d)

**Sol:** Free board = crest - NPL governed by given 3 factors

# 66. Ans: (a)

- **Sol:** Major function of spur is to control the river channel. So that it may run along a specified curve and protect the river banks from scouring.
- 67. Ans: (a)

# 68. Ans: (d)

Sol: Standards for Irrigation waters

	Class of Water	Boron in ppm	Remarks
V	G AICA	0-0.5	Excellent to good for irrigation
	Ш	0.5-2.0	Good to injurious suitable only with permeable soils and moderate leaching harmful to more sen- sitive crops
	II	Over 2.0	Unfit for Irrigation

69. Ans: (d)

70. Ans: (d)

71. Ans: (c)

Sol:  $w_{L} = 60;$   $w_{p} = 20$   $I_{p} = w_{L} - w_{p}$  = 60 - 20 = 40  $I_{p} = 40$ Equation of A line  $I_{p} = 0.73 (w_{L} - 20)$  = 0.73 (60 - 20) = 29.2Calculated  $I_{p}$  is above A- line and  $w_{L}$  above 50% Soil is classified as CH

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# 72. Ans: (d)

## 73. Ans: (b)

**Sol:** The law of flow of water through soil was first studied by Darcy in 1856, we also demonstrated the laminar flow conditions experimentally. Hook's law states that the stress is directly

proportional to strain within the elastic limit.

#### 74. Ans: (a)

## Sol: Capillary potential:

Also known as matric potential  $(\Psi_m)$ .

It is that portion of the total water potential associated with more or less solid colloidal matrix system.

Free water has zero matric potential & will move into a dry soil because of these forces, negative for an unsaturated soil & zero for saturated soil.

Thus, removal of water from a soil-water system decreases the matric potential of the water remaining in the system.

## 75. Ans:(a)

#### Sol: Given

10 concentric circles

50 radius lines

We know that, Influence factor

 $= \frac{1}{\text{No of concentric circles} \times \text{No.of radial lines}}$  $= \frac{1}{10 \times 50} = 0.002$ 

76. Ans: (c)

#### 77. Ans: (b)

**Sol:** Minimum spacing for end bearing piles is 2.5D and for friction piles is 3D

#### 78. Ans: (c)

Sol: B = 0 for dry soil B = 1 for saturated soil Range :  $0 \le B \le 1$ 

# 79. Ans: (a)

**Sol:** When the tunnel is driven parallel to strike of the beds which amounts to same thing as at right angles to the dip, the pressure distributed to the exposes layers is unsymmetrical along the periphery of the tunnel opening. Bedding planes opening into

80. Ans: (c)

**Sol:** Total rainfall, 
$$RF = 6.2 + 5.0 = 11.2$$
 cm

conditions for sliding into the opening.

$$\phi = \frac{11.2 - RO}{t_e}$$
$$1.2 = \frac{11.2 - RO}{4}$$

RF - RO

the tunnel and hence offer potential planes and

Total Runoff, RO = 11.2 - 4.8 = 6.4 cm = 0.064 m Volume of Runoff = catchment area × total Runoff =  $250 \times 10^2 \times 0.064$ = 1600 ha-m

81. Ans: (d)

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**Sol: Coefficient of transmissibility** is the rate of flow of water through a vertical strip of aquifer of unit width & extending the full saturation height under unit hydraulic gradient.

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# <u>SSC - JE</u> **MODEL PAPER**

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Coefficient of permeability is the measure of capacity of soil with which the water can easily flow through it. It is also known as Darcy coefficient of permeability

 $k = \frac{v}{i}$ 

v - discharge velocity of water,

i - hydraulic gradient

Storage coefficient or specific storativity of a porous medium is defined as the volume of water released (or) added into a unit volume of the aquifer under unit declination in the peizometric head  $(\phi)$ 

Storage coefficient,  $S_o = \frac{\Delta V_W}{V \Delta \phi}$  $\Delta V_w$  - amount of water released or added to aquifer

V - Total volume of aquifer,

 $\Delta \phi$  - change in piezometric head.

Specific retention of an aquifer is the rate of volume of water it will retain after saturation against the force of gravity to its own volume. Specific retention,  $S_r = \frac{W_r}{V} \times 100$ W<sub>r</sub> - Volume of water retained,

V - Total volume of aquifer.

#### 82 Ans: (b)

83. Ans: (d)  
Sol: 
$$GC = \frac{30 + R}{R} = \frac{30 + 80}{80} = 1.375\%$$
  
(or)

$$GC = \frac{75}{R} = \frac{75}{80} \times 100 = 0.9375$$

Use minimum of these two Compensated Gradient = 5 - 0.9375=4.0625%

# 84. Ans: (a)

Sol: A traffic rotary is justified

- $\rightarrow$  No. of intersecting roads = 4 to 7
- Requires a large area of land  $\rightarrow$
- Lowest limit and highest limit of traffic  $\rightarrow$ volumes are 500 and 5000 veh/hr

## 85. Ans: (b)



	Terrain	Maximum S.E (e <sub>max</sub> )
1	Plain (or) Rolling	7%
2	Hilly terrain without snow bound	10%
3	Hilly terrain with snow bound	7%

# 86. Ans: (b)

Sol: Bituminous materials or asphalts are extensively used for roadway construction, primarily because of their excellent binding characteristics and water proofing properties and relatively low cost.



Except stop and Give-way signs remaining all Regulatory signs will be provided on circular disc only.

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**CIVIL ENGINEERING** 

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#### 88. Ans: (d) 97. Ans: (a) Sol: Departure 89. Ans: (c) N Sol: • Railway tracks are banked on curves to obtain necessary centripetal force from the horizontal S θ component of the weight of the train. When it takes a circular turn on a curved rail W 🖌 ► E (or) road, it experiences an additional force, Latitude θ termed as centripetal force, acting towards the centre of the circle. Every Road/Tracks are banked on curves to S Departure allow vehicles to take turn at relative faster speed without losing the grip. 98. Ans: (c) Sol: Swing, $S = 230^{\circ}$ 90. Ans: (b) Rotation angle = $S - 180^{\circ}$ Sol: Flangeway clearance is the distance between $= 230 - 180^{\circ} = 50^{\circ}$ adjacent faces of stock rail and tongue rail at the heel of switch. 99. Ans: (b) 100. Ans: (c) 93. Ans: (b) 91. Ans: (c) 92. Ans: (b) 94. Ans: (a) 95. Ans: (b) 96. Ans: (d)

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