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Question paper for recruitment of Assistant Executive Engineer 'CIVIL'

Time: 3 Hours   Total: 100 Marks

I) Tick (✓) the correct answer: (30x1 = 30 marks)

1. Introducing a man to her husband, a woman said, "His brother's father is the only son of my grandfather." How is the woman related to this man?
a) Mother   b) Aunt   c) Sister   d) Daughter

2. 16 (81) 25   36 (168) 49   64 (?) 81
a) 121   b) 184   c) 250   d) 287

3. 10. If 5@6=61 and 8@10=164,then 7@9=?
a) 125   b) 63   c) 130   d) 32

4. In a certain code language if the word 'MUSEUM' is coded as 'LSPAPG', then how will the word 'PALACE' be coded in that language?
 a) OYIWXY   b) OYIXYW   c) IYXYWO   d.) YXWYOI

5. 4.A monkey starts climbing up a tree 20ft. tall. Each hour, it hops 3ft. and slips back 2ft. How much time would it take the monkey to reach the top?
a) 21 hours   b) 12 hours   c) 18 hours   d) 15 hours

6. A watch shows 4.30 Hrs. If the minute hand points to east, in what direction will the hour hand point?
A) North-West   b) South-East   c) North-East   d) North

7. In a row of trees, a tree is 34th from left end and 15th from right end. How many trees are there in the row?
a) 47   b) 48   c) 49   d) 50

8. If 'eraser' is called 'box', 'box' is called 'pencil' , 'pencil' is called 'sharpner' , and 'sharpener' is called 'bag' , what will a child write with?
a) eraser   b) bag   c) pencil   d) sharpener

9. If a car runs at 60km/h, it completes a certain distance in 18 minutes. At what average speed ,in kilometres per hour ,would this car need to cover the same distance in 20 minutes?

a) 68 km/hr   b) 44 km/h   c) 54 km/hr   d) 58km/h

10. Sohan and Mohan are waiting to get on the school bus. Sohan is seventh in line. Mohan is in the middle of the line. There are six students between Sohan and Mohan. How many students are waiting in the line.

a)12   b)18   c)25   d)27

11. The appropriate meaning of the proverb/idiom "bolt from the blue" is

a)Thundering   b) A complete surprise   c) deep in colour   d) Very fast.

12. One who is able to use his right and left hands equally well:

a) sinister   b) ambivalent   c.)ambidextrous   d)amateur

13. The boy was cured _____ typhoid.

a) from   b) for   c) of   d) through

14. Calcutta university is _____ university which was established in the 19th Century.

a) an   b) the   c) this   d) a

15. Which of the spelling is correct

a)Etiquete   b)Ettiquete   c)Etiquette   d)Etiquettee

16. A sentence has been given in Active/ passive voice. Out of the four suggested alternative, select the one which best expresses the same sentence in Passive /Active Voice.

"You surprise me"

a)I am to be surprised.   b) You are surprised   c) I am surprised   d) Me is surprised.

17. Find the correct synonym for the word "Repercussion"

a) magnificent   b) reaction   c)acceptance   d) resistance

18. How many pegs of wine _____ yesterday?

a)you have drank   b) were you drinking   c) did you drink   d) do you drink.

19. A _____ of camels.

a) pack   b)caravan   c) swarm   d) pride.

20. Choose the sequence to form the correct sentence.

It has been established that

A: Einstein was

B: although a great scientist

C: weak in arithmetic

D: right from his school days

a)DCAB   b)BACD   c)BADC   d)CBAD

21.Which among the following iconic structures almost burnt down recently after a devastating blaze?

a)The Colosseum   b)Wembley stadium   c)Westminister Abbey   d)Notre Dame Cathedral

22.Which of the following country has hosted the 2018 Winter Olympic?

a)North Korea   b)Japan   c)USA   d)South Korea

23. When is the International Museum Day observed every year?

a)18th May   b) 10th May   c)24th May   d) none of the options.

24.At present, how many States and Union Territories does India comprise of ?

a) 27 & 6   b)28 & 5   c)29 & 7   d)30 & 8

25.The maximum strength of the House of the People as per the Constitution of India is

a)475   b)543   c)550   d)552

26. Which of the following country is not a member of BRICS group of nations.

a)Brazil   b)South Africa   c)Saudi Arabia   d)India

27.In which year was Mother Teresa awarded the Nobel Peace Prize?

a)1975   b)1979   c)1985   d)1990

28. Who is the current Secretary-General of the United Nations ?

a)Antonio Guteress   b) Kofi A. Annan   c)Ban Ki-Moon   d)none of the options.

29.Which is the highest Wartime gallantry award given to individuals for service to Republic of India.

a)Ashoka Chakra   b)Param Vir Chakra   c)Maha Vir Chakra   d)Kirti Chakra

30.Which country will host the FIFA World Cup in the year 2022.

a)Mexico   b) Germany   c) Japan   d) Qatar

II) Tick (✓) the correct answer: (30x1=30 marks)

1) Minimum period before striking of formwork for R.C.C slab spanning upto 4.5 meter is

a) 3 days   b) 7days   c)14 days   d)21 days

2) The recommended range of slump for Tremie concrete is between

a) 75-100 mm   b)100-125mm   c)125-175mm   d) 200-250mm

3) The final allowable deflection(long term) in RCC beams/slabs due to all loads including effect of temperature ,creep & shrinkage measured from the as cast level of the supports of floors, roofs and all other horizontal members should not normally exceed

a)span/125   b)span/200   c)span /250   d)span /375

4)Minimum reinforcement in RCC slab when high strength deformed bars are used should not be less than _____ of the total cross –sectional area .

a)0.08%   b)0.10%   c)0.15%   d) 0.12%

5) The maximum permissible free fall of concrete may be taken as _____ to avoid segregation.

a) 1.5 meter   b)1 meter   c)2 meter   d)none of the above

6) A column is called a long column if the ratio of the effective length to the least lateral dimension is

a)≥3   b) ≥6   c) ≥12   d) ≥10

7) The maximum spacing of contraction joint in unreinforced cement concrete rigid pavement as per IRC specification is

a)2.5 mtr   b)4.5 mtr   c)3.5 mtr   d)6 mtr

8)Which of the pavement has high flexural strength

a)Rigid pavement   b)Flexible pavement c)WBM road   d)all the above

9)A sand having fineness modulus more than _____ will be unsuitable for making satisfactory concrete.

a)2.6   b)2.9   c)3.0   d)3.2

10) When 1 cm on plan drawing represents 10 meter on the ground, the representative fraction of the scale of drawing is

a)1/10   b)1/100   c)1/1000   d)1/10000

11)The vertical distance between any two consecutive contour lines is called

a)Vertical equivalent   b)Horizontal equivalent   d)Contour gradient   d)Contour interval

12) When several contours coincide , it indicates a

a)Vertical cliff   b) Valley   c) Ridge   d)Overhanging cliff

13) A first class brick should not absorb water more than _____ of its dry weight after 24 hours immersion in cold water

a)5%   b)15%   c)20%   d)30%

14)The construction of temporary structure required to support an unsafe structure is called

a)Underpinning   b)Scaffolding   c)Jacking   d)Shoring

15)The type of bond in a brick masonry consisting of alternate course of header and stretcher is called

a)Flemish bond   b)English bond   c)Herringbone bond   d)None of above

16)The unit weight of brickwork (Brick masonry) is generally considered as

a) 1500 kg/m^3 b) 1850 kg/m^3 c) 1920 kg/m^3 d) 2050 kg/m^3

17)The range for per capita minimum demand of water for domestic use for communities with population above 100000 together with full flushing system is

a)150 -200 lphd   b)250 -300lphd   c)300 - 400 lphd   d)100 -150 lphd

18) In routine vertical load test of RCC pile the maximum test load applied is _____ times the working load .

a)1.2 times   b)1.5 times   c)2.5 times   d) 3 times

19)'N' value of SPT test in the range of 30-50 indicates

a) Very loose soil   b) Loose soil   c) Dense soil   d)None of the above

20)Depth (D) to Width (B) ratio for shallow foundation is generally considered

a) ≤ 1 b) ≤ 2 c) ≤ 3 d) ≤ 5

21)As per IS : 875 (Part 3) ,Design wind speed (V_z) at any height 'z' in m/sec for wind load analysis is given by

a)$0.5 V_b\ k_1\ k_2\ k_3$ b)$V_b k_1\ k_2$ c) $3.5\ V_b\ k_1 k_2\ k_3$ d) $V_b\ k_1\ k_2\ k_3$

22)As per IS code ,the total design lateral force or Design seismic base shear (V_b) along any principal direction is given by

a) A_h W   b) A_h W/3   c) A_h W/2   d) none of the above

where W=Seismic weight of the building & A_h = Design horizontal acceleration spectrum .

23)For determining the Seismic forces , the country is classified into _____ seismic zones as per latest IS 1893 code.

a) 5   b) 4   c) 3   d)6

24) The relationship between radius of curvature (R) ,Bending Moment (M) and flexural rigidity (EI) is given by

a) R=M/EI   b)EI=R/M   c)M=EI/R   d)none of the above

25)Diameter of a bolt hole is usually taken as

a) nominal diameter of bolt   b) nominal diameter +1.5mm   c)nominal diameter +3 mm
d)none of the above

26) The rise and fall method of leveling provides complete check on

a) Backsight   b)Intermediate sight   c)Foresight   d)all the above

27) In direct tension lap length including anchorage value in reinforcement shall be

a) $2L_d$ or 30 Ø whichever is greater   b) least of $3L_d$ or 24 Ø   c) $2L_d$ d) L_d

where L_d is the development length & Ø is the dia of bar.

28) The short term static modulus of elasticity of concrete (E $_c$) can be assumed as

a) 4000 $\sqrt{f}_{ck}$ b) 5000 $\sqrt{f}_{ck}$ c)5000 f_{ck} d) 6000 $\sqrt{f}_{ck}$

where f_{ck} is the characteristic strength of concrete.

29) The approximate weight of each 600mm x 600 mm x 10 mm thick vitrified tiles is

a)7 .5 kg   b)5 kg   c)10 kg   d)2.5kg

30) As per IS 456(2000) ,the minimum cement content for M20 grade reinforced concrete under mild exposure with normal weight aggregates of 20mm nominal maximum size is

_____.

a)250kg/m^3 b) 275kg/m^3 c) 300kg/m^3 d)350kg/m^3

III) Answer any ONE (a) or (b):   (15 Marks)

(a) Find the support reactions at A & B and also draw the Bending Moment & Shear Force diagram for the propped cantilever beam shown below.
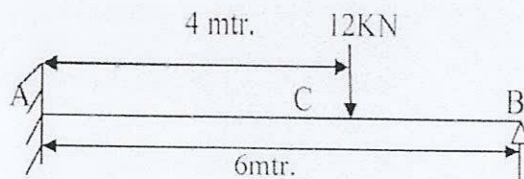
(b) Write short notes on:

1) Initial load test on RCC pile.

2) Bearing capacity of soil.

3) Non-Destructive Tests (NDT) for Concrete.

IV) Design the simply supported RCC beam given below as singly reinforced using Limit State Method of design as per IS 456(2000). Consider M20 grade concrete & Fe415 grade steel.

                                                                   (25 Marks)
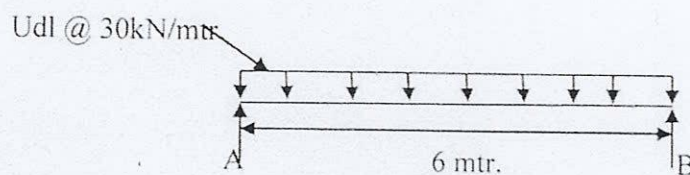
Given data: - The limiting value of the depth of neutral axis ($x_{u,max/d}$) is 0.48 for Fe 415 grade of steel.

Enclosure --- Page No. 96 & 73 of IS 456: 2000 and page no. 48 & 179 of SP 16 provided for reference.

XXXXXXXX

ANNEX G

(Clause 38.1)

MOMENTS OF RESISTANCE FOR RECTANGULAR AND T-SECTIONS

G-0 The moments of resistance of rectangular and T-sections based on the assumptions of **38.1** are given in this annex.

G-1 RECTANGULAR SECTIONS

G-1.1 Sections Without Compression Reinforcement

The moment of resistance of rectangular sections without compression reinforcement should be obtained as follows :

a) Determine the depth of neutral axis from the following equation :

$$\frac{x_u}{d} = \frac{0.87 \, f_y \, A_{st}}{0.36 \, f_{ck} \, b.d}$$

b) If the value of x_u/d is less than the limiting value (*see* Note below **38.1**), calculate the moment of resistance by the following expression :

$$M_u = 0.87 \, f_y \, A_{st} \, d \left(1 - \frac{A_{st} \, f_y}{bd \, f_{ck}} \right)$$

c) If the value of x_u/d is equal to the limiting value, the moment of resistance of the section is given by the following expression :

$$M_{u,lim} = 0.36 \, \frac{x_{u,\,max}}{d} \left(1 - 0.42 \, \frac{x_{u,\,max}}{d} \right) bd^2 \, f_{ck}$$

d) If x_u/d is greater than the limiting value, the section should be redesigned.

In the above equations,

x_u = depth of neutral axis,

d = effective depth,

f_y = characteristic strength of reinforcement,

A_{st} = area of tension reinforcement,

f_{ck} = characteristic compressive strength of concrete,

b = width of the compression face,

$M_{u,lim}$ = limiting moment of resistance of a section without compression reinforcement, and

$x_{u,\,max}$ = limiting value of x_u from **39.1**.

G-1.2 Section with Compression Reinforcement

Where the ultimate moment of resistance of section

exceeds the limiting value, $M_{u,\,lim}$ compression reinforcement may be obtained from the following equation :

$$M_u - M_{u,\,lim} = f_{sc} \, A_{sc} \, (d - d')$$

where

$M_u, M_{u,\,lim}, d$ are same as in **G-1.1**,

f_{sc} = design stress in compression reinforcement corresponding to a strain of

$$0.003\,5 \, \frac{\left(x_{u,\,max} - d' \right)}{x_{u,\,max}}$$

where

$x_{u,\,max}$ = the limiting value of x_u from **38.1**,

A_{sc} = area of compression reinforcement, and

d' = depth of compression reinforcement from compression face.

The total area of tension reinforcement shall be obtained from the following equation :

$$A_{st} = A_{st1} + A_{st2}$$

where

A_{st} = area of the total tensile reinforcement,

A_{st1} = area of the tensile reinforcement for a singly reinforced section for $M_{u,\,lim}$, and

$A_{st2} = A_{sc} \, f_{sc} / 0.87 \, f_y$.

G-2 FLANGED SECTION

G-2.1 For $x_u < D_f$, the moment of resistance may be calculated from the equation given in **G-1.1**.

G-2.2 The limiting value of the moment of resistance of the section may be obtained by the following equation when the ratio $D_f \, / \, d$ does not exceed 0.2 :

$$M_u = 0.36 \frac{x_{u,max}}{d} \left(1 - 0.42 \frac{x_{u,max}}{d} \right) f_{ck} \, b_w d^2$$

$$+ \, 0.45 \, f_{ck} \, (b_f - b_w) \, D_f \left(d - \frac{D_f}{2} \right)$$

where

$M_u, x_{u,max}, d$ and f_{ck} are same as in **G-1.1**,

b_f = breadth of the compression face/flange,

b_w = breadth of the web, and

D_f = thickness of the flange.

Table 19 Design Shear Strength of Concrete, τ_c, N/mm²

(Clauses 40.2.1, 40.2.2, 40.3, 40.4, 40.5.3, 41.3.2, 41.3.3 and 41.4.3)

$100\frac{A_s}{bd}$	Concrete Grade					
	M 15	M 20	M 25	M 30	M 35	M 40 and above
(1)	(2)	(3)	(4)	(5)	(6)	(7)
≤ 0.15	0.28	0.28	0.29	0.29	0.29	0.30
0.25	0.35	0.36	0.36	0.37	0.37	0.38
0.50	0.46	0.48	0.49	0.50	0.50	0.51
0.75	0.54	0.56	0.57	0.59	0.59	0.60
1.00	0.60	0.62	0.64	0.66	0.67	0.68
1.25	0.64	0.67	0.70	0.71	0.73	0.74
1.50	0.68	0.72	0.74	0.76	0.78	0.79
1.75	0.71	0.75	0.78	0.80	0.82	0.84
2.00	0.71	0.79	0.82	0.84	0.86	0.88
2.25	0.71	0.81	0.85	0.88	0.90	0.92
2.50	0.71	0.82	0.88	0.91	0.93	0.95
2.75	0.71	0.82	0.90	0.94	0.96	0.98
3.00 and above	0.71	0.82	0.92	0.96	0.99	1.01

NOTE— The term A_s is the area of longitudinal tension reinforcement which continues at least one effective depth beyond the section being considered except at support where the full area of tension reinforcement may be used provided the detailing conforms to 26.2.2 and 26.2.3

Table 20 Maximum Shear Stress, $\tau_{c\,max}$, N/mm²

(Clauses 40.2.3, 40.2.3.1, 40.5.1 and 41.3.1)

Concrete Grade	M 15	M 20	M 25	M 30	M 35	M 40 and above
$\tau_{c\,max}$, N/mm²	2.5	2.8	3.1	3.5	3.7	4.0

c) Inclined stirrups.

Where bent-up bars are provided, their contribution towards shear resistance shall not be more than half that of the total shear reinforcement.

Shear reinforcement shall be provided to carry a shear equal to $V_u - \tau_c\, bd$ The strength of shear reinforcement V_{us} shall be calculated as below:

a) For vertical stirrups:

$$V_{us} = \frac{0.87 f_y A_{sv} d}{s_v}$$

b) For inclined stirrups or a series of bars bent-up at different cross-sections:

$$V_{us} = \frac{0.8.7 f_y A_{sv} d}{s_v} (\sin\alpha + \cos\alpha)$$

c) For single bar or single group of parallel bars, all bent-up at the same cross-section:

$$V_{us} = 0.87 f_y A_{sv} \sin\alpha$$

where

A_{sv} = total cross-sectional area of stirrup legs or bent-up bars within a distance s_v.

s_v = spacing of the stirrups or bent-up bars along the length of the member,

τ_v = nominal shear stress,

τ_c = design shear strength of the concrete,

b = breadth of the member which for flanged beams, shall be taken as the breadth of the web b_w,

f_y = characteristic strength of the stirrup or bent-up reinforcement which shall not be taken greater than 415 N/mm²,

α = angle between the inclined stirrup or bent-up bar and the axis of the member, not less than 45°, and

d = effective depth.

TABLE 2 FLEXURE — REINFORCEMENT PERCENTAGE, p_t FOR SINGLY REINFORCED SECTIONS

$f_{ck} = 20 \ N/mm^2$

M_u/bd^2, N/mm²	f_y, N/mm² 240	250	415	480	500
0.30	0.146	0.140	0.085	0.073	0.070
0.35	0.171	0.164	0.099	0.086	0.082
0.40	0.196	0.188	0.114	0.098	0.094
0.45	0.222	0.213	0.128	0.111	0.106
0.50	0.247	0.237	0.143	0.123	0.119
0.55	0.272	0.262	0.158	0.136	0.131
0.60	0.298	0.286	0.172	0.149	0.143
0.65	0.324	0.311	0.187	0.162	0.156
0.70	0.350	0.336	0.203	0.175	0.168
0.75	0.376	0.361	0.218	0.188	0.181
0.80	0.403	0.387	0.233	0.201	0.193
0.85	0.430	0.412	0.248	0.215	0.206
0.90	0.456	0.438	0.264	0.228	0.219
0.95	0.483	0.464	0.280	0.242	0.232
1.00	0.511	0.490	0.295	0.255	0.245
1.05	0.538	0.517	0.311	0.269	0.258
1.10	0.566	0.543	0.327	0.283	0.272
1.15	0.594	0.570	0.343	0.297	0.285
1.20	0.622	0.597	0.359	0.311	0.298
1.25	0.650	0.624	0.376	0.325	0.312
1.30	0.678	0.651	0.392	0.339	0.326
1.35	0.707	0.679	0.409	0.354	0.339
1.40	0.736	0.707	0.426	0.368	0.353
1.45	0.765	0.735	0.443	0.383	0.367
1.50	0.795	0.763	0.460	0.397	0.382
1.55	0.825	0.792	0.477	0.412	0.396
1.60	0.855	0.821	0.494	0.427	0.410
1.65	0.885	0.850	0.512	0.443	0.425
1.70	0.916	0.879	0.530	0.458	0.440
1.75	0.947	0.909	0.547	0.473	0.454
1.80	0.978	0.939	0.565	0.489	0.469
1.85	1.009	0.969	0.584	0.505	0.484
1.90	1.041	1.000	0.602	0.521	0.500
1.95	1.073	1.030	0.621	0.537	0.515
2.00	1.106	1.062	0.640	0.553	0.531
2.02	1.119	1.074	0.647	0.559	0.537
2.04	1.132	1.087	0.655	0.566	0.543
2.06	1.145	1.099	0.662	0.573	0.550
2.08	1.159	1.112	0.670	0.579	0.556
2.10	1.172	1.125	0.678	0.586	0.562
2.12	1.185	1.138	0.685	0.593	0.569
2.14	1.199	1.151	0.693	0.599	0.575
2.16	1.212	1.164	0.701	0.606	0.582
2.18	1.226	1.177	0.709	0.613	0.588
2.20	1.239	1.190	0.717	0.620	0.595
2.22	1.253	1.203	0.725	0.627	0.602
2.24	1.267	1.216	0.733	0.633	0.608
2.26	1.281	1.230	0.741	0.640	0.615
2.28	1.295	1.243	0.749	0.647	0.621
2.30	1.309	1.256	0.757	0.654	0.628
2.32	1.323	1.270	0.765	0.661	0.635
2.34	1.337	1.283	0.773	0.668	0.642
2.36	1.351	1.297	0.781	0.675	0.648
2.38	1.365	1.311	0.790	0.683	0.655
2.40	1.380	1.324	0.798	0.690	0.662
2.42	1.394	1.338	0.806	0.697	0.669
2.44	1.408	1.352	0.814	0.704	0.676
2.46	1.423	1.366	0.823	0.711	0.683
2.48	1.438	1.380	0.831	0.719	0.690
2.50	1.452	1.394	0.840	0.726	0.697
2.52	1.467	1.408	0.848	0.734	0.704
2.54	1.482	1.423	0.857	0.741	0.711
2.56	1.497	1.437	0.866	0.748	0.719
2.58	1.512	1.451	0.874	0.756	0.726
2.60	1.527	1.466	0.883	0.764	0.733
2.62	1.542	1.481	0.892	0.771	0.740
2.64	1.558	1.495	0.901	0.779	0.748
2.66	1.573	1.510	0.910	0.786	0.755
2.68	1.588	1.525	0.919	0.794	
2.70	1.604	1.540	0.928		
2.72	1.620	1.555	0.937		
2.74	1.636	1.570	0.946		
2.76	1.651	1.585	0.955		
2.78	1.667	1.601			
2.80	1.683	1.616			
2.82	1.700	1.632			
2.84	1.716	1.647			
2.86	1.732	1.663			
2.88	1.749	1.679			
2.90	1.766	1.695			
2.92	1.782	1.711			
2.94	1.799	1.727			
2.96	1.816	1.743			
2.98	1.833	1.760			

NOTE — Blanks indicate inadmissible reinforcement percentage (see Table E).

DESIGN AIDS FOR REINFORCED CONCRETE

TABLE 62 SHEAR — VERTICAL STIRRUPS

Values of V_{us}/d for two legged stirrups, kN/cm.

STIRRUP SPACING, cm	$f_y = 250$ N/mm² DIAMETER, mm				$f_y = 415$ N/mm² DIAMETER, mm			
	6	8	10	12	6	8	10	12
5	2·460	4·373	6·833	9·839	4·083	7·259	11·342	16·334
6	2·050	3·644	5·694	8·200	3·403	6·049	9·452	13·611
7	1·757	3·124	4·881	7·028	2·917	5·185	8·102	11·667
8	1·537	2·733	4·271	6·150	2·552	4·537	7·089	10·208
9	1·367	2·429	3·796	5·466	2·269	4·033	6·302	9·074
10	·1·230	2·186	3·416	4·920	2·042	3·630	5·671	8·167
11	1·118	1·988	3·106	4·472	1·856	3·299	5·156	7·424
12	1·025	1·822	2·847	4·100	1·701	3·025	4·726	6·806
13	0·946	1·682	2·628	3·784	1·571	2·792	4·363	6·286
14	0·879	1·562	2·440	3·514	1·458	2·593	4·051	5·833
15	0·820	1·458	2·278	3·280	1·361	2·420	3·781	5·445
16	0·769	1·366	2·135	3·075	1·276	2·269	3·545	5·104
17	0·723	1·286	2·010	2·894	1·201	2·135	3·336	4·804
18	0·683	1·215	1·898	2·733	1·134	2·016	3·151	4·537
19	0·647	1·151	1·798	2·589	1·075	1·910	2·985	4·298
20	0·615	1·093	1·708	2·460	1·020	1·815	2·836	4·083
25	0·492	0·875	1·367	1·968	0·817	1·452	2·269	3·267
30	0·410·	0·729	1·139	1·640	0·681	1·210	1·890	2·722
35	0·351	0·625	0·976	1·406	0·583	1·037	1·620	2·333
40	0·307	0·547	0·854	1·230	0·510	0·907	1·418	2·042
45	0·273	0·486	0·759	1·093	0·454	0·807	1·260	1·815

TABLE 63 SHEAR — BENT-UP BARS

Values of V_{us} for singal bar, kN

BAR DIAMETER, mm	$f_y = 250$ N/mm²		$f_y = 415$ N/mm²	
	$\alpha = 45°$	$\alpha = 60°$	$\alpha = 45°$	$\alpha = 60°$
10	12·08	14·79	20·05·	24·56
12	17·39	21·30	28·87	35·36
16	30·92	37·87	51·33	62·87
18	39·14	47·93	64·97	79·57
20	48·32	59·18	80·21	98·23
22	58·46	71·60	97·05	118·86
25	75·49	92·46	125·32	153·48
28	94·70	115·98	157·20	192·53
32	123·69	151·49	205·32	251·47
36	156·54	191·73	259·86	318·27

NOTE — α is the angle between the bent-up bar and the axis of the member.

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