2705/302
2709/302
2710/302
STRUCTURES III
June/July 2018
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN BUILDING TECHNOLOGY
DIPLOMA IN ARCHITECTURE

MODULE III

STRUCTURES III

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:
answer booklet;
calculator;
drawing instruments.
Answer any ***FIVE*** *of the following* ***EIGHT*** *questions.*
All questions carry equal marks.
Maximum marks for each part of a question are indicated.
Candidates should answer the questions in English.

This paper consists of 12 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

Turn over

1. Using moment distribution method, analyse the beam loaded as shown in **figure 1** and hence sketch the shear force and bending moment diagrams indicating the values at all critical points. (20 marks)

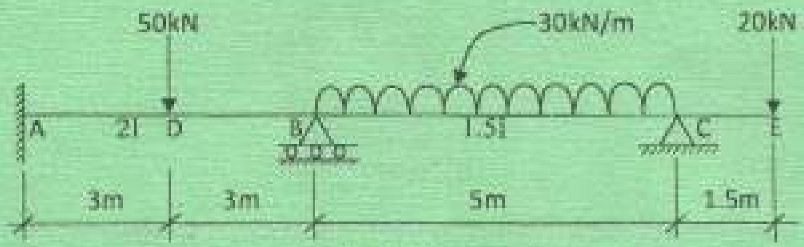


Figure 1

2. Using the three moments theorem, analyse the beam, shown in **figure 2** and hence sketch the shear force diagram indicating all critical values. (20 marks)

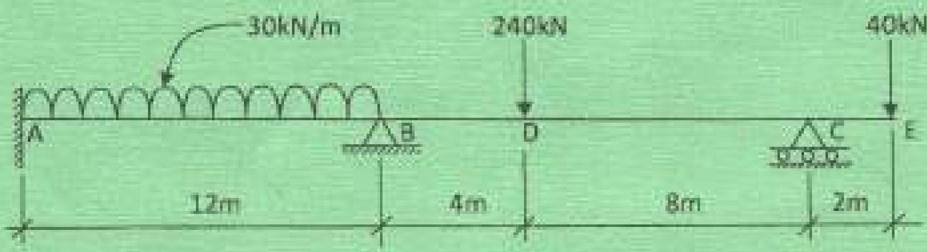


Figure 2

3. (a) Sketch the influence line diagrams for the following when the unit load crosses the beam as shown in **figure 3**:

(i) reaction at A;
(ii) reaction at B;
(iii) bending moment at D. ($11\frac{1}{2}$ marks)

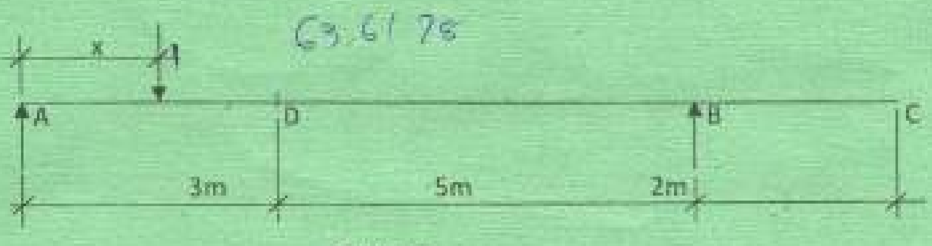


Figure 3

(b) Determine the maximum bending moment at D when a uniformly distributed load of 50kN/m and 6m long crosses the beam shown in **figure 3** from A to C. (8 ½ marks)

4. Using moment distribution method, analyse the frame shown in **figure 4** and hence Sketch the bending moment diagram indicating the values at all the critical points. (20 marks)

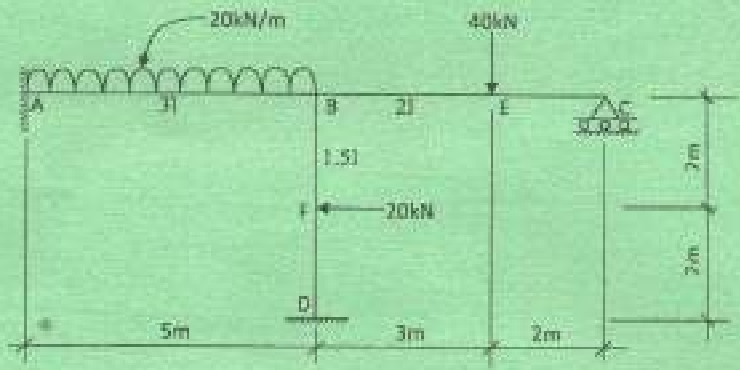


Figure 4

5. (a) Define the following terms with respect to structural timber:

(i) dry stress;
(ii) grade stress;
(iii) glued laminated member;
(iv) strength class. (4 marks)

(b) Describe mechanical stress grading of timber. (4 marks)

(c) A timber column of strength class 3 (SC3) consists of a 100 mm square section which is restrained at both ends in position but not in direction. Assuming the actual length is 3.9 m, determine the maximum long term load the column can carry. Using the information in tables 1 to 3. (12 marks)

6. **Figure 5** shows the layout plan of a suspended reinforced concrete slab supported on universal beams (UB). Assuming the beams are fully laterally restrained select a suitable UB section in grade 43 steel for beam marked 'X' to satisfy bending, shear and deflection. Use the the following information:

- density of reinforced concrete = 2,400Kg/m^3
- live load = 3kN/m^2
- partitions = 1.5kN/m^2
- finishes = 0.8kN/m^2
- E = 205kN/m^2
- permissible deflection = $\frac{1}{360}$ span. (20 marks)

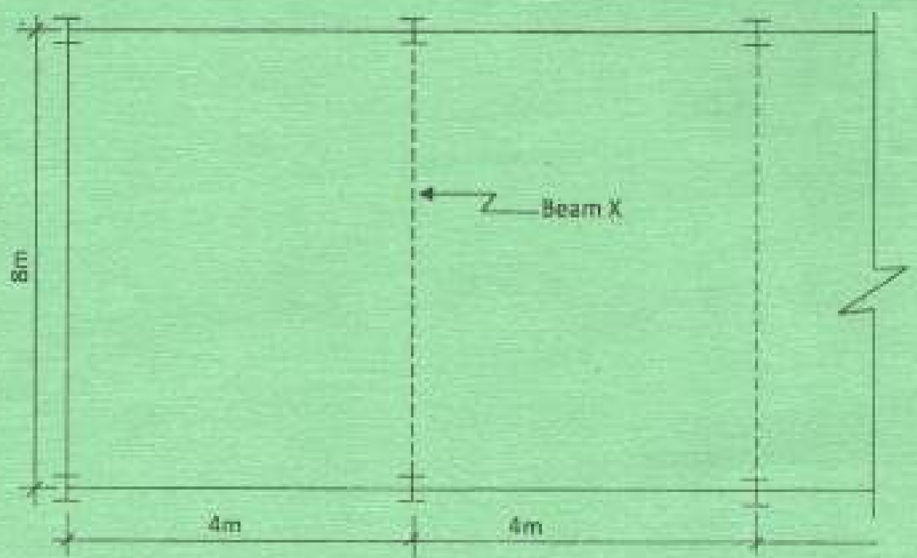


Figure 5

7. Timber floor joists of effective length 4 m are spaced at 450 mm centres and have bearing of 100 mm at the supports. Using the following information, design the joists for bending and hence check for shear, deflection and bearing:

- Timber strength class SC3
- Medium term loading duration.
- Loading:
  - T & G boarding and ceiling = 0.24 kN/m^2
  - Joists = 0.14 kN/m^2
  - Imposed load = 1.5 kN/m^2
  - Available timber sizes
    - 225 x 50 mm
    - 200 x 50 mm
    - 175 x 50 mm
  - Use information provided in tables. (20 marks)

8. (a) State **two** examples for each of the following limit states:

(i) ultimate;
(ii) serviceability. (2 marks)

(b) With the aid of sketches, describe the following methods of design of steel structures:

(i) simple design;
(ii) rigid design. (6 marks)

(c) Determine the compressive resistance for a 305 x 305 x 118 Kg/m UC section if it is encased in concrete of compressive strength 20 N/mm^2 as per BS 5950. (12 marks)

Table 1

Duration of loading	Value of K_3
Long term (e.g. dead + permanent imposed)	1.00
Medium term (e.g. dead +snow, dead + temporary imposed)	1.25
Short term (e.g. dead + imposed + wind, dead + imposed + snow + wind)	1.50
Very short term (e.g. dead + imposed + wind)	1.75

Table 2: Depth factor, K7

1. $K_7 = 1.17$ *for solid beams having a depth < 72mm*
2. $K_7 = (300/h)^{0.11}$ for solid beams with $72mm < h < 300mm$
3. $K_7 = 0.81(h^2 + 92300)/(h^2 + 56800)$ for solid beams with $h < 300mm$

Table 3: Grade stresses, modulus of elasticity and density for strength classes SC1-9 for the dry exposure condition

Strength Class	*Bending parallel to grain*	*Tension parallel to grain*	*Compression parallel to grain*	*Compression perpendicular to grain**		*Shear parallel to grain*	*Modulus of elasticity* (E_{mean})	($E_{minimum}$)	*Approximate Density*
Nmm^{-2})	*(Nmm^{-2})*	*(Nmm^{-2})*	*(Nmm^{-2})*	*(Nmm^{-2})*	*(Nmm^{-2})*	*(Nmm^{-2})*	*(Nmm^{-2})*	*(kgm^{-3})*	
SC1	2.8	2.2	3.5	2.1	1.2	0.46	6800	4500	540
SC2	4.1	2.5	5.3	2.1	1.6	0.66	8000	5000	540
SC3	5.3	3.2	6.8	2.2	1.7	0.67	8800	5800	540
SC4	7.5	4.5	7.9	2.4	1.9	0.71	9900	6600	590
SC5	10.0	6.0	8.7	2.8	2.4	1.00	10700	7100	590/760
SC6	12.5	7.5	12.5	3.8	2.8	1.50	14100	11800	840
SC7	15.0	9.0	14.5	4.4	3.3	1.75	16200	13600	960
SC8	17.5	10.5	16.5	5.2	3.9	2.00	18700	15600	1080
SC9	20.5	12.3	19.5	6.1	4.6	2.25	21600	18000	1200

Table 4

Reinforcement-bar areas (mm^2) per metre width for various bar spacings

Bar Diameter (mm)	Bar spacing (mm)									
	75	100	125	150	175	200	225	250	275	300
6	377	283	226	189	162	142	126	113	103	94
8	671	503	402	335	287	252	223	201	183	168
10	1047	785	628	523	449	393	349	314	286	262
12	1508	1131	905	754	646	566	503	452	411	377
16	2681	2011	1608	1340	1149	1005	894	804	731	670
20	4189	3142	2513	2094	1795	1571	1396	1257	1142	1047
25	6545	4909	3927	3272	2805	2454	2182	1963	1785	1636
32	-	8042	6434	5362	4596	4021	3574	3217	2925	2681
40	-	-	10050	8378	7181	6283	5585	5027	4570	4189

Areas of group of reinforcement bars (mm^2)

Bar Diameter (mm)	Number of bars									
	1	2	3	4	5	6	7	8	9	10
6	28	57	85	113	141	170	198	226	254	283
8	50	101	151	201	251	302	352	402	452	503
10	79	157	236	314	393	471	550	628	707	785
12	113	226	339	452	565	679	792	905	1017	1131
16	201	402	603	804	1005	1206	1407	1608	1809	2011
20	314	628	942	1257	1571	1885	2199	2513	2827	3142
25	491	982	1473	1963	2454	2945	3436	3927	4418	4909
32	804	1608	2412	3216	4021	4825	5629	6433	7237	8042
40	1256	2513	3769	5026	6283	7539	8796	10050	11310	12570

Table 5

Design grade	*Thickness (mm), less than or equal to*	*Sections, plates and hollow sections, p_y ($N\ mm^{-2}$)*
43	16	275
	40	265
	63	255
	80	245
50	100	235
	16	355
	40	345
	63	335
	80	325
55	100	315
	16	450
	25	430
	40	
	63	400

Design in structural steelwork to BS 5950

Table 6: Limiting width to thickness ratios (elements which exceed these limits are to be taken as class 4, slender cross-sections)

Type of element (all rolled sections)	*Class of section*		
	(1) Plastic	*(2) Compact*	*(3) Semi-compact*
Outstand element of compression flange	$\frac{b}{T} \le 8.5\,\varepsilon$	$\frac{b}{T} \le 9.5\,\varepsilon$	$\frac{b}{T} \le 15\,\varepsilon$
Web with neutral axis at mid-depth	$\frac{d}{t} \le 79\,\varepsilon$	$\frac{d}{t} \le 98\,\varepsilon$	$\frac{d}{t} \le 120\,\varepsilon$
Web subject to compression throughout	$\frac{d}{t} \le 39\,\varepsilon$	$\frac{d}{t} \le 39\,\varepsilon$	$\frac{d}{t} \le 39\,\varepsilon$

Note. $\varepsilon = (275/p_y)^{1/2}$ (4.4)

Table 7 : Compressive strength, pc (N mm^{-2}) for struts

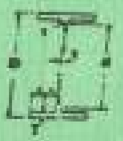
λ	p_y 225	245	255	265	275
15	225	245	255	265	275
20	224	243	253	263	272
25	220	239	248	258	267
30	216	234	243	253	262
35	211	229	238	247	256
40	207	224	233	241	250
42	205	222	231	239	248
44	203	220	228	237	245
46	201	218	226	234	242
48	199	215	223	231	239
50	197	213	221	229	237
52	195	210	218	226	234
54	192	208	215	223	230
56	190	205	213	220	227
58	188	202	210	217	224
60	185	200	207	214	221
62	183	197	204	210	217
64	180	194	200	207	213
66	178	191	197	203	210
68	175	188	194	200	206
70	172	185	190	196	202
72	[illegible]	181	187	193	198
74	167	178	183	189	194
76	164	175	180	185	190
78	161	171	176	181	186
80	158	168	172	177	181
82	155	164	169	173	177
84	152	161	165	169	173
86	149	157	161	165	169
88	146	154	158	161	165
90	143	150	154	157	161
92	139	147	150	153	156
94	136	143	147	150	152

λ	225	245	255	265	275
96	133	140	143	146	148
98	130	137	139	142	145
100	127	133	136	138	141
102	124	130	132	135	137
104	122	127	129	131	133
106	119	124	126	128	130
108	116	121	123	125	126
110	113	118	120	121	123
112	111	115	117	118	120
114	108	112	114	115	117
116	105	109	111	112	114
118	103	106	108	109	111
120	100	104	105	107	108
122	98	101	103	104	105
124	96	99	100	101	102
126	94	96	97	99	100
128	91	94	95	96	97
130	89	92	93	94	95
135	84	86	87	88	89
140	79	81	82	83	84
145	75	77	78	78	79
150	71	72	73	74	74
155	67	69	69	70	70
160	64	65	66	66	66
165	60	61	62	63	63
170	57	58	59	59	60
175	55	56	56	56	57
180	52	53	53	54	54
185	49	50	51	51	51
190	47	48	48	48	49
195	45	46	46	46	47
200	43	44	44	44	44

Table 8: Compressive strength, pc (N mm^{-2}) for struts (Table 27(c), BS 5950)

λ	p_y 225	245	255	265	275
15	225	245	255	265	275
20	224	243	253	263	272
25	220	239	248	258	267
30	216	234	243	253	262
35	211	229	238	247	256
40	207	224	233	241	250
42	205	222	231	239	248
44	203	220	228	237	245
46	201	218	226	234	242
48	199	215	223	231	239
50	197	213	221	229	237
52	195	210	218	226	234
54	192	208	215	223	230
56	190	205	213	220	227
58	188	202	210	217	224
60	185	200	207	214	221
62	183	197	204	210	217
64	180	194	200	207	213
66	178	191	197	203	210
68	175	188	194	200	206
70	172	185	190	196	202
72	169	181	187	193	198
74	167	178	183	189	194
76	164	175	180	185	190
78	161	171	176	181	186
80	158	168	172	177	181
82	155	164	169	173	177
84	152	161	165	169	173
86	149	157	161	165	169
88	146	154	158	161	165
90	143	150	154	157	161
92	139	147	150	153	156
94	136	143	147	150	152

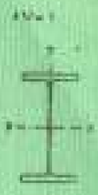
λ	p_y 225	245	255	265	275
96	133	140	143	146	148
98	130	137	139	142	145
100	127	133	136	138	141
102	124	130	132	135	137
104	122	127	129	131	133
106	119	124	126	128	130
108	116	121	123	125	126
110	113	118	120	121	123
112	111	115	117	118	120
114	108	112	114	115	117
116	105	109	111	112	114
118	103	106	108	109	111
120	100	104	105	107	108
122	98	101	103	104	105
124	96	99	100	101	102
126	94	96	97	99	100
128	91	94	95	96	97
130	89	92	93	94	95
135	84	86	87	88	89
140	79	81	82	83	84
145	75	77	78	78	79
150	71	72	73	74	74
155	67	69	69	70	70
160	64	65	66	66	66
165	60	61	62	63	63
170	57	58	59	59	60
175	55	56	56	56	57
180	52	53	53	54	54
185	49	50	51	51	51
190	47	48	48	48	49
195	45	46	46	46	47
200	43	44	44	44	44



UNIVERSAL BEAMS

DIMENSIONS AND PROPERTIES

Serial size	Mass per metre	Depth of section D	Width of section B	Thickness Web t	Thickness Flange T	Root radius r	Depth between fillets d	Area of section
mm	kg	mm	mm	mm	mm	mm	mm	cm²
457 × 191	98	467.4	192.8	11.4	19.6	10.2	407.9	125.3
	89	463.6	192.0	10.6	17.7	10.2	407.9	113.9
	82	460.2	191.3	9.9	16.0	10.2	407.9	104.5
	74	457.2	190.5	9.1	14.5	10.2	407.9	95.0
	67	453.6	189.9	8.5	12.7	10.2	407.9	85.4
457 × 152	82	465.1	153.5	10.7	18.9	10.2	406.9	104.5
	74	461.3	152.7	9.9	17.0	10.2	406.9	95.0
	67	457.2	151.9	9.1	15.0	10.2	406.9	85.4
	60	454.7	152.9	8.0	13.3	10.2	407.7	75.9
	52	449.8	152.4	7.6	10.9	10.2	407.7	66.5
406 × 178	74	412.8	179.7	9.7	16.0	10.2	360.5	95.0
	67	409.4	178.8	8.8	14.3	10.2	360.5	85.5
	60	406.4	177.8	7.8	12.8	10.2	360.5	76.0
	54	402.6	177.6	7.6	10.9	10.2	360.5	68.4
406 × 140	46	402.3	142.4	6.9	11.2	10.2	359.6	59.0
	39	397.3	141.8	6.3	8.6	10.2	359.6	49.4
356 × 171	67	364.0	173.2	9.1	15.7	10.2	312.2	85.4
	57	358.6	172.1	8.0	13.0	10.2	312.2	72.2
	51	355.6	171.5	7.3	11.5	10.2	312.2	64.6
	45	352.0	171.0	6.9	9.7	10.2	312.2	57.0
356 × 127	39	352.8	126.0	6.5	10.7	10.2	311.1	49.4
	33	348.5	125.4	5.9	8.5	10.2	311.1	41.8
305 × 165	54	310.9	166.8	7.7	13.7	8.9	265.6	68.4
	46	307.1	165.7	6.7	11.8	8.9	265.6	58.8
	40	303.8	165.1	6.1	10.2	8.9	265.6	51.5
305 × 127	48	310.4	125.2	8.9	14.0	8.9	264.6	60.8
	42	306.6	124.3	8.0	12.1	8.9	264.6	53.2
	37	303.8	123.5	7.2	10.7	8.9	264.6	47.5
305 × 102	33	312.7	102.4	6.6	10.8	7.6	275.9	41.8
	28	308.9	101.9	6.1	8.9	7.6	275.9	36.3
	25	304.8	101.6	5.8	6.8	7.6	275.9	31.4
254 × 146	43	259.6	147.3	7.3	12.7	7.6	218.9	55.1
	37	256.0	146.4	6.4	10.9	7.6	218.9	47.5
	31	251.5	146.1	6.1	8.6	7.6	218.9	40.0
254 × 102	28	260.4	102.1	6.4	10.0	7.6	225.0	36.2
	25	257.0	101.9	6.1	8.4	7.6	225.0	32.2
	22	254.0	101.6	5.8	6.8	7.6	225.0	28.4
203 × 133	30	206.8	133.8	6.3	9.6	7.6	172.3	38.0
	25	203.2	133.4	5.8	7.8	7.6	172.3	32.3

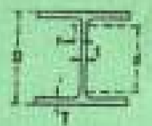


UNIVERSAL BEAMS

DIMENSIONS AND PROPERTIES

Serial size	Moment of inertia Axis x-x Gross	Moment of inertia Axis x-x Net	Moment of inertia Axis y-y	Radius of gyration Axis x-x	Radius of gyration Axis y-y	Elastic modulus Axis x-x	Elastic modulus Axis y-y	Ratio D/T
mm	cm⁴	cm⁴	cm⁴	cm	cm	cm³	cm³	
457 × 191	45717	40615	2343	19.10	4.33	1956	243.0	23.8
	41021	36456	2086	18.98	4.28	1770	217.4	26.2
	37103	32986	1871	18.84	4.23	1612	195.6	28.8
	33388	29696	1671	18.75	4.19	1461	175.5	31.6
	29401	26190	1452	18.55	4.12	1296	152.9	35.7
457 × 152	36215	32074	1143	18.62	3.31	1557	149.0	24.6
	32435	28744	1012	18.48	3.26	1406	132.5	27.1
	28577	25357	878	18.29	3.21	1250	115.5	30.5
	25464	22611	794	18.31	3.23	1120	103.9	34.2
	21345	19035	645	17.92	3.11	949.0	84.6	41.3
406 × 178	27329	24062	1545	16.96	4.03	1324	172.0	25.8
	24329	21428	1365	16.87	4.00	1189	152.7	28.6
	21508	18934	1199	16.82	3.97	1058	134.8	31.8
	18626	16437	1017	16.50	3.85	925.3	114.5	37.0
406 × 140	15647	13785	539	16.29	3.02	777.8	75.7	35.9
	12452	11017	411	15.88	2.89	626.9	58.0	46.0
356 × 171	19522	17045	1362	15.12	3.99	1073	157.3	23.2
	16077	14053	1109	14.92	3.92	896.5	128.9	27.6
	14156	12384	968	14.80	3.87	796.2	112.9	30.9
	12091	10609	812	14.57	3.78	686.9	95.0	36.3
356 × 127	10087	8813	357	14.29	2.69	571.8	56.8	33.0
	8200	7511	280	14.00	2.59	470.6	44.7	41.0
305 × 165	11710	10134	1061	13.09	3.94	753.3	127.3	22.7
	9948	8609	897	13.00	3.90	647.9	108.2	26.0
	8523	7384	763	12.86	3.85	561.2	92.4	29.8
305 × 127	9504	8643	460	12.50	2.75	612.4	73.5	22.2
	8143	7409	388	12.37	2.70	531.2	62.5	25.3
	7162	6519	337	12.28	2.67	471.5	54.6	28.4
305 × 102	6487	5800	193	12.46	2.15	415.0	37.8	29.0
	5421	4862	157	12.22	2.08	351.0	30.8	34.6
	4387	3962	120	11.82	1.96	287.9	23.6	44.6
254 × 146	6558	5706	677	10.91	3.51	505.3	92.0	20.4
	5556	4834	571	10.82	3.47	434.0	78.1	23.4
	4439	3879	449	10.53	3.35	353.1	61.5	29.1
254 × 102	4008	3569	178	10.52	2.22	307.9	34.9	26.0
	3408	3046	148	10.29	2.14	265.2	29.0	30.6
	2867	2575	120	10.04	2.05	225.7	23.6	37.3
203 × 133	2887	2476	384	8.72	3.18	279.3	57.4	21.5
	2356	2027	310	8.54	3.10	231.9	46.4	26.0

In calculating the net moment of inertia, each flange of 300 mm or greater width is reduced by two holes, and each flange less than 300 mm wide by one hole. See Explanatory Notes.



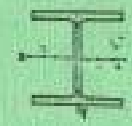
UNIVERSAL COLUMNS

Parallel Flanges

DIMENSIONS AND PROPERTIES

10

Serial Size	Mass per metre	Depth of Section D	Width of Section B	Thickness Web t	Thickness Flange T	Root Radius r	Depth between Fillets d	Area of Section
mm	kg	mm	mm	mm	mm	mm	mm	cm^2
356 x 406	634	474.7	424.1	47.6	77.0	15.2	290.1	808.1
	551	455.7	418.5	42.0	67.5	15.2	290.1	701.8
	467	436.6	412.4	35.9	58.0	15.2	290.1	595.5
	393	419.1	407.0	30.6	49.2	15.2	290.1	500.9
	340	406.4	403.0	26.5	42.9	15.2	290.1	432.7
	287	393.7	399.0	22.6	36.5	15.2	290.1	366.0
	235	381.0	395.0	18.5	30.2	15.2	290.1	299.8
Column Core	477	427.0	424.4	48.0	53.2	15.2	290.1	607.2
356 x 368	202	374.7	374.4	16.8	27.0	15.2	290.1	257.9
	177	368.3	372.1	14.5	23.8	15.2	290.1	225.7
	153	362.0	370.2	12.6	20.7	15.2	290.1	195.2
	129	355.6	368.3	10.7	17.5	15.2	290.1	164.9
305 x 305	283	365.3	321.8	26.9	44.1	15.2	246.6	360.4
	240	352.6	317.9	23.0	37.7	15.2	246.6	305.6
	198	339.9	314.1	19.2	31.4	15.2	246.6	252.3
	158	327.2	310.6	15.7	25.0	15.2	246.6	201.2
	137	320.5	308.7	13.8	21.7	15.2	246.6	174.6
	118	314.5	306.8	11.9	18.7	15.2	246.6	149.8
	97	307.8	304.8	9.9	15.4	15.2	246.6	123.3
254 x 254	167	289.1	264.5	19.2	31.7	12.7	200.2	212.4
	132	276.4	261.0	15.6	25.1	12.7	200.2	167.7
	107	266.7	258.3	13.0	20.5	12.7	200.2	136.6
	89	260.4	255.9	10.5	17.3	12.7	200.2	114.0
	73	254.0	254.0	8.6	14.2	12.7	200.2	92.9
203 x 203	86	222.3	208.8	13.0	20.5	10.2	160.8	110.1
	71	215.9	206.2	10.3	17.3	10.2	160.8	91.1
	60	209.6	205.2	9.3	14.2	10.2	160.8	75.8
	52	206.2	203.9	8.0	12.5	10.2	160.8	66.4
	46	203.2	203.2	7.3	11.0	10.2	160.8	58.8
152 x 152	37	161.8	154.4	8.1	11.5	7.6	123.4	47.4
	30	157.5	152.9	6.6	9.4	7.6	123.4	38.2
	23	152.4	152.4	6.1	6.8	7.6	123.4	29.8



UNIVERSAL COLUMNS

Parallel Flanges

DIMENSIONS AND PROPERTIES

Serial Size	Moment of Inertia Axis x–x Gross	Moment of Inertia Axis x–x Net	Moment of Inertia Axis y–y	Radius of Gyration Axis x–x	Radius of Gyration Axis y–y	Elastic Modulus Axis x–x	Elastic Modulus Axis y–y	Ratio D/T
mm	cm^4	cm^4	cm^4	cm	cm	cm^3	cm^3	-
356 x 406	275140	243076	98211	18.5	11.0	11592	4632	6.2
	227023	200312	82665	18.0	10.9	9964	3951	6.8
	183118	161331	67905	17.5	10.7	8388	3293	7.5
	146765	129159	55410	17.1	10.5	7004	2723	8.5
	122474	107657	46816	16.8	10.4	6027	2324	9.5
	99994	87843	38714	16.5	10.3	5080	1940	10.8
	79110	69424	31008	16.3	10.2	4153	1570	12.6
Column Core	172391	152936	68057	16.8	10.6	8075	3207	8.0
356 x 368	66307	57806	23632	16.0	9.57	3540	1262	13.9
	57153	49798	20470	15.9	9.52	3104	1100	15.5
	48525	42250	17470	15.8	9.46	2681	943.8	17.5
	40246	35040	14555	15.6	9.39	2264	790.4	20.3
305 x 305	78777	72827	24545	14.8	8.25	4314	1525	8.3
	64177	59256	20239	14.5	8.14	3641	1273	9.4
	50832	46933	16230	14.2	8.02	2991	1034	10.8
	38740	35769	12524	13.9	7.89	2368	806.3	13.1
	32838	30314	10672	13.7	7.82	2049	691.4	14.8
	27601	25477	9006	13.6	7.75	1755	587.0	16.8
	22202	20496	7268	13.4	7.68	1442	476.9	20.0
254 x 254	29914	27171	9796	11.9	6.79	2070	740.6	9.1
	22416	20350	7444	11.6	6.66	1622	570.4	11.0
	17510	15890	5901	11.3	6.57	1313	456.9	13.0
	14307	12976	4849	11.2	6.52	1099	378.9	15.1
	11360	10297	3873	11.1	6.46	894.5	305.0	17.9
203 x 203	9462	8374	3119	9.27	5.32	851.5	298.7	10.8
	7647	6758	2536	9.16	5.28	708.4	246.0	12.5
	6088	5383	2041	8.96	5.19	581.1	199.0	14.8
	5263	4653	1770	8.90	5.16	510.4	173.6	16.5
	4564	4035	1539	8.81	5.11	449.2	151.5	18.5
152 x 152	2218	1932	709	6.84	3.87	274.2	91.78	14.1
	1742	1515	558	6.75	3.82	221.2	73.06	16.8
	1263	1104	403	6.51	3.68	165.7	52.95	22.4

Note: One hole is deducted from each flange under 300 mm wide (serial size) and two holes from each flange 300 mm and over (serial size), in calculating the Net Moment of Inertia about x–x.

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