

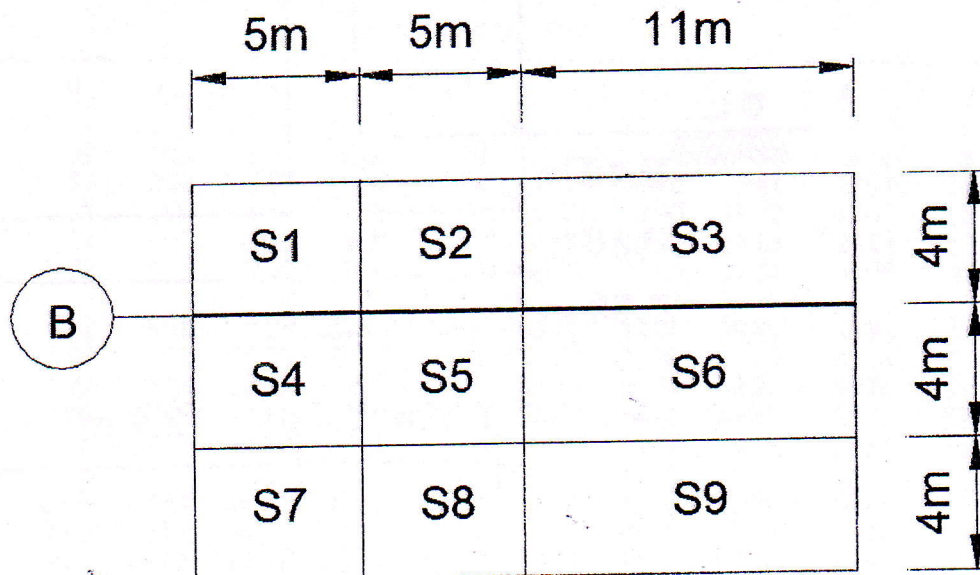
GANPAT UNIVERSITY**B. Tech. Semester: 8th Civil Engineering****Regular Examination (CBCS) - April – June 2017****2CI801: Advanced Structural Design****Maxi. Time: 3 Hours****Maxi. Marks: 70**

- Instruction:**
1. Answer to the two sections must be written in separate answer book.
 2. Figures to the right indicate full mark.
 3. Assume suitable data if required.
 4. Use the SP 16 graphs which is given at the end of paper.

Section - I**Que. – 1**

Design and draw detailing of reinforcement of one-way continuous slab of Plan A. **10**

Consider Live load act on slab as 3 kN/m^2 and Floor Finish as 1 kN/m^2 . Use M20 concrete and Fe415 steel. Spacing of reinforcement should satisfy cracking criteria.

**Plan A****Que. – 2**

Consider all slab having uniform thickness $D=150\text{mm}$ and $d=125\text{mm}$. Design and draw detailing of reinforcement of continuous beam shown in Plan A. Consider Live load act on slab as 3 kN/m^2 and Floor Finish as 1 kN/m^2 . Use M20 concrete and Fe415 steel. Neglect Self weight of beam. **10**

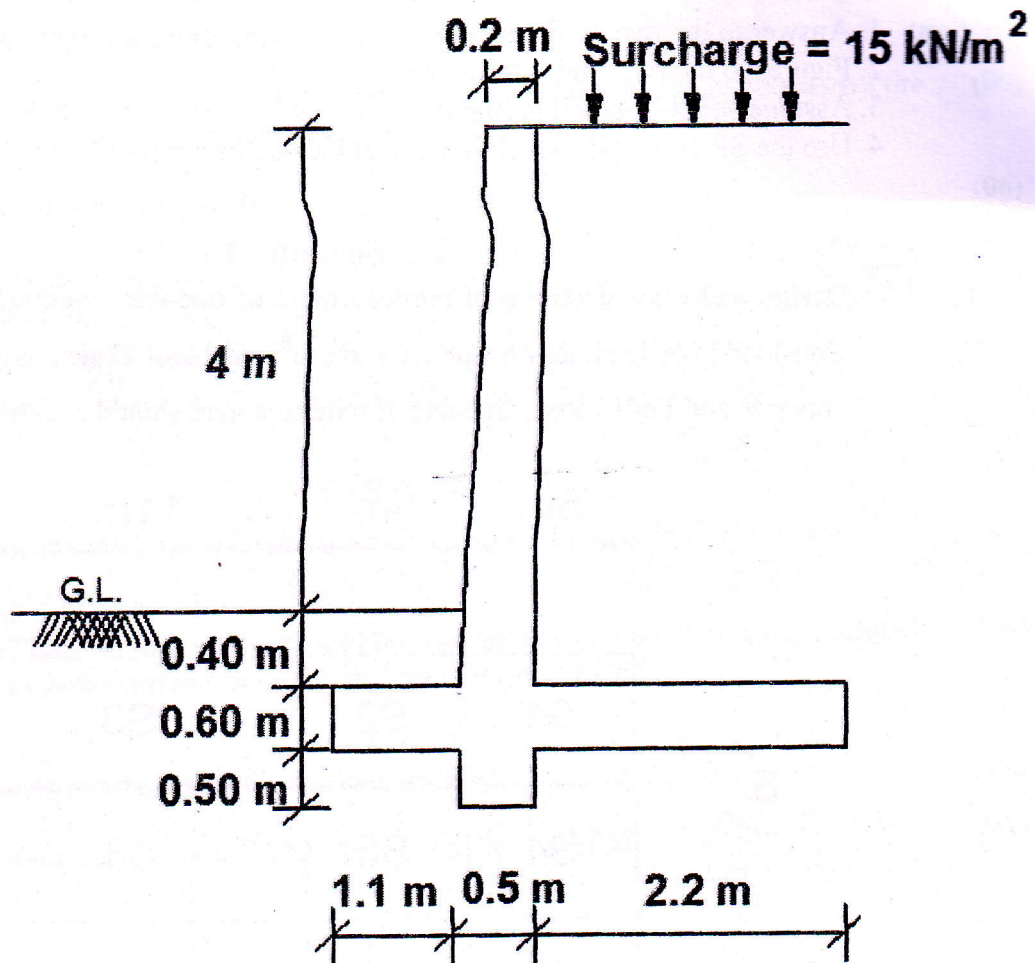
OR**Que. – 2**

Design a short column and do necessary check if required for following data **10**

Column : 330 mm X 500 mm	Effective cover : 50 mm
Axial Load : 2000 kN	M20 Concrete and Fe415 Steel
Moment in x direction : 100 kN.m	(Note : All loads are factored loads,
Moment in y direction : 50 kN.m	Reinforcement distributed equally on four side)

Que. - 3

Check the stability of retaining wall and design Hell slab (only top bars) for the following data: Unit Weight of soil = 18 kN/m^3 , S.B.C. of soil = 140 kN/m^2 , Angle of internal friction = 30° , Coefficient of friction between base and soil = 0.65, Surcharge pressure 15 kN/m^2 , effective cover 50 mm, M20 Concrete and Fe415 steel.



OR

Que. - 3

Design an isolated sloped column footing for a R.C.C. Column of $500 \text{ mm} \times 500 \text{ mm}$ size carries an axial compressive load of 1600 kN. Consider Edge thickness of footing as 300mm, Clear cover 50 mm and safe bearing capacity of soil as 200 kN/m^2 . Use M20 concrete and Fe415 steel.

Section - II

- Que. - 4 (A) Find out Panel point load of DL and LL for the How type Truss span width is 18m, c/c distance of two trusses is 5m. 6
- (B) Find out Panel point load of WL for the How type Truss span width is 18m, c/c distance of two trusses is 5m. Bottom Chord Member is 12m above the ground Level. 6

OR

- Que. - 4 (A) Design Purlin for the Combine load of 6.5 kN/m^2 . 6
 (B) Draw Truss Components and enlist it. 6
 Que. - 5 Find out Member force of Bottom Chord Member for the Panel point force of DL, 11
 LL & WL respectively are 2.1kN, 4.0kN, 7.2kN.
 OR
 Que. - 5 (A) Design a Column for Compressive load of 500kN. 6
 (B) Describe Load Combination and give its code Provisions. 5
 Que. - 6 (A) Design of Column Base Plate for the truss which having compressive force of 600kN. 6
 (B) Design Grillage Foundation For the Load of 1100kN. 6

END OF PAPER

TABLE 95 AREAS OF GIVEN NUMBERS OF BARS IN cm^2

NUMBER OF BARS	BAR DIAMETER, mm												
	6	8	10	12	14	16	18	20	22	25	28	32	36
1	0.28	0.50	0.79	1.13	1.54	2.01	2.54	3.14	3.80	4.91	6.16	8.04	10.18
2	0.56	1.00	1.57	2.26	3.07	4.02	5.08	6.28	7.60	9.81	12.31	16.08	20.35
3	0.84	1.50	2.35	3.39	4.61	6.03	7.63	9.42	11.40	14.72	18.47	24.12	30.53
4	1.13	2.01	3.14	4.52	6.15	8.04	10.17	12.56	15.20	19.63	24.63	32.17	40.71
5	1.41	2.51	3.92	5.65	7.69	10.05	12.72	15.70	19.00	24.54	30.78	40.21	50.89
6	1.69	3.01	4.71	6.78	9.23	12.06	15.26	18.85	22.80	29.45	36.94	48.25	61.07
7	1.97	3.51	5.49	7.91	10.77	14.07	17.81	21.99	26.60	34.36	43.10	56.29	71.25
8	2.26	4.02	6.28	9.04	12.31	16.08	20.35	25.13	30.41	39.27	49.26	64.34	81.43
9	2.54	4.52	7.06	10.17	13.85	18.09	22.90	28.27	34.21	44.17	55.41	72.38	91.60
10	2.82	5.02	7.85	11.31	15.39	20.10	25.44	31.41	38.01	49.08	61.57	80.42	101.78
11	3.11	5.52	8.63	12.44	16.93	22.11	27.99	34.55	41.81	53.99	67.73	88.46	111.96
12	3.39	6.03	9.42	13.57	18.47	24.12	30.53	37.69	45.61	58.90	73.89	96.51	122.14
13	3.67	6.53	10.21	14.70	20.01	26.13	33.08	40.84	49.41	63.81	80.04	104.55	132.32
14	3.95	7.03	10.99	15.83	21.55	28.14	35.62	43.98	53.21	68.72	86.20	112.59	142.50
15	4.24	7.54	11.78	16.96	23.09	30.15	38.17	47.12	57.02	73.63	92.36	120.63	152.68
16	4.52	8.04	12.56	18.09	24.63	32.17	40.71	50.26	60.82	78.54	98.52	128.68	162.86
17	4.80	8.54	13.35	19.22	26.17	34.18	43.26	53.40	64.62	83.44	104.67	136.72	173.03
18	5.08	9.04	14.13	20.35	27.70	36.19	45.80	56.54	68.42	88.35	110.83	144.76	183.21
19	5.37	9.55	14.92	21.48	29.24	38.20	48.34	59.69	72.22	93.26	116.99	152.80	193.39
20	5.65	10.05	15.70	22.62	30.78	40.21	50.89	62.83	76.02	98.17	123.15	160.85	203.57

TABLE 96 AREAS OF BARS AT GIVEN SPACINGS

Values in cm² per Meter Width

SPACING cm	BAR DIAMETER, mm											
	6	8	10	12	14	16	18	20	22	25	28	32
5	5.65	10.05	15.71	22.62	30.79	40.21	50.89	62.83	76.03	98.17	123.15	160.85
6	4.71	8.38	13.09	18.85	25.66	33.51	42.41	52.36	63.36	81.81	102.68	134.04
7	4.04	7.18	11.22	16.16	21.99	28.72	36.35	44.88	54.30	70.12	87.96	114.89
8	3.53	6.28	9.82	14.14	19.24	25.13	31.81	39.27	47.52	61.36	76.9	100.53
9	3.14	5.58	8.73	12.57	17.10	22.34	28.27	34.91	42.24	54.54	68.42	89.36
10	2.83	5.03	7.85	11.31	15.39	20.11	25.45	31.42	38.01	49.09	61.57	80.42
11	2.57	4.57	7.14	10.28	13.99	18.28	23.13	28.56	34.56	44.62	55.98	73.11
12	2.36	4.19	6.54	9.42	12.83	16.75	21.21	26.18	31.68	40.91	51.31	67.02
13	2.17	3.87	6.04	8.70	11.84	15.47	19.57	24.17	29.24	37.76	47.37	61.86
14	2.02	3.59	5.61	8.08	11.00	14.36	18.18	22.44	27.15	35.06	43.98	57.45
15	1.88	3.35	5.24	7.54	10.26	13.40	16.96	20.94	25.34	32.72	41.05	53.62
16	1.77	3.14	4.91	7.07	9.62	12.57	15.90	19.63	23.76	30.68	38.48	50.27
17	1.66	2.96	4.62	6.65	9.05	11.83	14.97	18.48	22.36	28.87	36.22	47.31
18	1.57	2.79	4.36	6.28	8.55	11.17	14.44	17.45	21.12	27.27	34.21	44.68
19	1.49	2.65	4.13	5.95	8.10	10.58	13.39	16.53	20.01	25.84	32.41	42.33
20	1.41	2.51	3.93	5.65	7.70	10.05	12.72	15.71	19.01	24.54	30.79	40.21
21	1.35	2.39	3.74	5.39	7.33	9.57	12.12	14.96	18.10	23.37	29.32	38.30
22	1.28	2.28	3.57	5.14	7.00	9.14	11.57	14.28	17.28	22.31	27.99	36.56
23	1.23	2.18	3.41	4.92	6.69	8.74	11.06	13.66	16.53	21.34	26.77	34.97
24	1.18	2.09	3.27	4.71	6.41	8.38	10.60	13.09	15.84	20.54	25.66	33.51
25	1.13	2.01	3.14	4.52	6.16	8.04	10.18	12.57	15.20	19.63	24.63	32.17
26	1.09	1.93	3.02	4.35	5.92	7.73	9.79	12.08	14.62	18.88	23.68	30.93
27	1.05	1.86	2.91	4.19	5.70	7.45	9.42	11.64	14.08	18.18	22.81	29.79
28	1.01	1.79	2.80	4.04	5.50	7.18	9.09	11.22	13.58	17.53	21.99	28.76
29	0.97	1.73	2.71	3.90	5.31	6.93	8.77	10.83	13.11	16.93	21.23	27.73
30	0.94	1.68	2.62	3.77	5.13	6.70	8.48	10.47	12.67	16.36	20.52	26.81
32	0.88	1.57	2.45	3.53	4.81	6.28	7.95	9.82	11.88	15.34	19.24	25.13
34	0.83	1.48	2.31	3.33	4.53	5.91	7.48	9.24	11.18	14.44	18.11	23.65
36	0.78	1.40	2.18	3.14	4.28	5.58	7.07	8.73	10.56	13.63	17.10	22.34
38	0.74	1.32	2.07	2.98	4.05	5.29	6.70	8.27	10.00	12.92	16.20	21.16
40	0.71	1.26	1.96	2.83	3.85	5.03	6.36	7.85	9.50	12.27	15.39	20.11

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

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

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

Concrete : M 20
Steel : Fe 415

TABLE 18.4. Reinforcement percentages for Doubly Reinforced Sections

$f_{ck} = 20 \text{ N/mm}^2$
 $f_y = 415 \text{ N/mm}^2$

M_u / bd^2 N/mm^2	$d'/d=0.05$		$d'/d=0.10$		$d'/d=0.15$		$d'/d=0.20$	
	p_t	p_c	p_t	p_c	p_t	p_c	p_t	p_c
2.77	0.958	0.002	0.958	0.002	0.959	0.003	0.959	0.003
2.80	0.967	0.011	0.968	0.012	0.968	0.013	0.969	0.015
2.90	0.996	0.042	0.998	0.045	1.001	0.049	1.004	0.054
3.00	1.025	0.072	0.029	0.077	1.034	0.084	1.038	0.093
3.10	1.055	0.103	1.060	0.109	1.066	0.119	1.073	0.132
3.20	1.084	0.133	1.091	0.142	1.099	0.154	1.108	0.171
3.30	1.113	0.164	1.122	0.174	1.131	0.190	1.142	0.210
3.40	1.142	0.194	1.152	0.207	1.164	0.225	1.177	0.249
3.50	1.171	0.224	1.183	0.239	1.197	0.260	1.212	0.288
3.60	1.200	0.255	1.214	0.271	1.229	0.295	1.246	0.327
3.70	1.230	0.285	1.245	0.304	1.262	0.331	1.281	0.366
3.80	1.259	0.316	1.276	0.336	1.294	0.366	1.315	0.405
3.90	1.288	0.346	1.306	0.369	1.327	0.401	1.350	0.444
4.00	1.317	0.376	1.337	0.401	1.360	0.437	1.385	0.483
4.10	1.346	0.407	1.368	0.433	1.392	0.472	1.419	0.522
4.20	1.375	0.437	1.399	0.466	1.425	0.507	1.454	0.561
4.30	1.405	0.468	1.429	0.498	1.457	0.542	1.489	0.600
4.40	1.434	0.498	1.460	0.530	1.490	0.578	1.523	0.640
4.50	1.463	0.528	1.491	0.563	1.523	0.613	1.558	0.679
4.60	1.492	0.559	1.522	0.595	1.555	0.648	1.593	0.718
4.70	1.521	0.589	1.553	0.628	1.588	0.683	1.627	0.757
4.80	1.550	0.620	1.583	0.660	1.620	0.719	1.662	0.796
4.90	1.580	0.650	1.614	0.692	1.653	0.754	1.696	0.835
5.00	1.609	0.680	1.645	0.725	1.686	0.789	1.731	0.874
5.10	1.638	0.711	1.676	0.757	1.718	0.825	1.766	0.913
5.20	1.667	0.741	1.707	0.790	1.751	0.860	1.800	0.952
5.30	1.696	0.772	1.737	0.822	1.783	0.895	1.835	0.991
5.40	1.725	0.802	1.768	0.854	1.816	0.930	1.870	1.030
5.50	1.755	0.832	1.799	0.887	1.849	0.966	1.904	1.069
5.60	1.784	0.863	1.830	0.919	1.881	1.001	1.939	1.108
5.70	1.813	0.893	1.861	0.952	1.914	1.036	1.974	1.147
5.80	1.842	0.924	1.891	0.984	1.946	1.071	2.008	1.186
5.90	1.871	0.954	1.922	1.016	1.979	1.107	2.043	1.225
6.00	1.900	0.985	1.953	1.049	2.012	1.142	2.078	1.264
6.10	1.930	1.015	1.984	1.081	2.044	1.177	2.112	1.303
6.20	1.959	1.045	2.014	1.114	2.077	1.213	2.147	1.342
6.30	1.988	1.076	2.045	1.146	2.109	1.248	2.181	1.381
6.40	2.017	1.106	2.076	1.178	2.142	1.283	2.216	1.421
6.50	2.046	1.137	2.107	1.211	2.175	1.318	2.251	1.460
6.60	2.075	1.167	2.138	1.243	2.207	1.354	2.285	1.499
6.70	2.105	1.197	2.168	1.276	2.240	1.389	2.320	1.538
6.80	2.134	1.228	2.199	1.308	2.272	1.424	2.355	1.577
6.90	2.163	1.258	2.230	1.340	2.305	1.459	2.389	1.616
7.00	2.192	1.289	2.261	1.373	2.338	1.495	2.424	1.655
7.10	2.221	1.319	2.292	1.405	2.370	1.530	2.459	1.694

CHART 22
 Compression with bending. Reinforcement Distributed Equally on Four Sides.

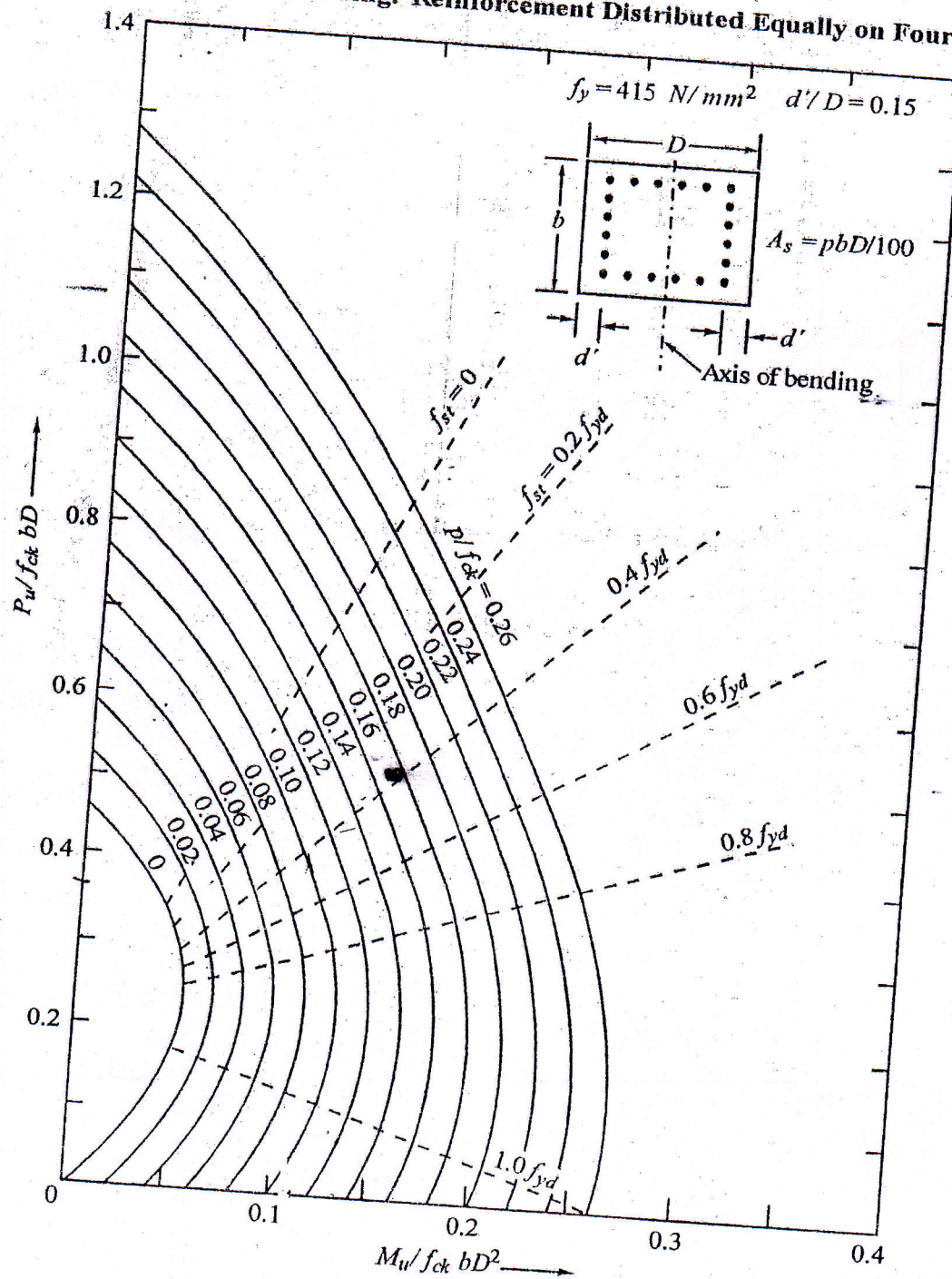


CHART 21
Compression with bending. Reinforcement Distributed Equally on Four Sides.

