LECTURE NOTES

ON

STRUCTURAL DESIGN-II

Diploma in Civil Engineering

By

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FEBRUARY 2018 JANUARY WTFSS T SD-IL (Numericals) 2 3 8 9 10 11 7 5 14 15 16 17 18 12 13 19 20 21 22 23 24 25 WEEK 01 • 001-364 26 27 28 Design a welded lap joint for max" efficiency welding & Fe'410 greade steel Shor *8 r=1.25 120mm × 8mm +9 (A) B = 10 120mm × 12mm = 11 = 12 120 mm A 100 a 937 3 #1 a ida i A Loral 0211 mar efficiency the joint will be TH For designed for full & strength of the thomas = 3 120 mm × 8 mm ato Z·e Alteratio Acres = 4 plate thinner Strength of 10 + 5 FA + WS REE ! = 6 mo 120×8 × 250 1.1 64 218.18KN = weld strength 7 2018

the through () . We also 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 002-363 · WEEK 01 Width of plates same, the weld size S & thick of plates # 由 sat 1.9 SA ta \$ to SB n 10 υ. SA . SB => = 11 SB = 1.55A = 12 - - Strength of weld fore plate A -thick Arrea of weldA = 2 = w) à Stress - tw/v3 46 < 3 strength Arrea Stres 4 × +5 = 6 S mw 120 - 25A * W) = 120 - 25B 2018

20 21 22 23 24 25 WEEK 01 • 003-362 27 28 weld for plate B Strength of Area = (Lw) = (tw) = w) (1.75B) Strep = Ju/3 Strength = Area x Stress w) x 0.75 x tu/ ¥3 Strength for plate strength Weld strength 0.7 fu/v. 2 95 0 KT 1.1.16 Well! Imw SA + (120. 120 -25 × 0.7×410 1.25×13 132.56 1205A-29 -25B $= 132.56 \left(120S_{A} - 2S_{A}^{2} + 120X1.5S_{A}^{2} - 2S_{A}^{2} + 1.5^{2}S_{A}^{2} \right)$ = 132.56 5005 - 6.55A2 2018

THURSDAY 18 19 20 21 22 23 24 004-361 · WEEK 01 25 26 27 28 29 30 31 132.56 (3005A - 6.55 218.18×103 = - 6.55A 1645.9 = 3005, 380S +1645.9 = D 6.55 6.4 mm 39. 8 rejecte - 11 Sis 1.55 9.6mm Check 3 mm larm 8mm plate OIT 1110 1.5 plate Min weld size 12 weld Max 5mm Hence 9.5mm weld for movi plate A & 6. for plates - 4 - 0CH N - 5 211-20

5 6 7 8 9 10 11 $()_{-}^{+}$ 12 13 14 15 16 17 18 19 20 21 22 23 24 25 FRIDAY WEEK 01 • 005-360 20 27 28 the max 2 Finol force that can ransmitted through double a batted oint nain Holts in Prows MIG Fe 410 plate 4.6grade) G . Thickness of plates connec teo 8 mmol 200 27142 19 - 10 10mm r 11 12.mm 1 - 12 Contract of the second s ٦ 30 - 1 80mm - 2 APRIL 30 = 3 X60 K MIG botts & f.6 grade bolt d= 16 mm 1.12 = 16+2=18mm aveva ÷6 fub = 400 MPa · 6 grade bolt THE R 4 2 For D 2- 5-5-1 1111 2018

5 6 4 7 8 10 11 12 13 14 16 17 15 SATURDAY 18 19 20 21 22 23 24 006-359 · WEEK 01 30 31 25 26 27 28 29 Strength of plate thime? plate = 10mm Thickness of - B width of plat section= No. of bolts ×9. Net area at A oction + 10 180 -3×18 X10 - 11 = 1260100 mm = 12 of plate Tearcing - 1 0.9 fu An Ymt - 2 0.9× 410×1200 = 3 1.25 - 4 = 371.950 Hand K - 5 bobt Shearing strength of : - 6 For 1 bolt (for lap single nn = 8 $n_s = 0$ 1 Total n= 1×G=G ns=0×6 = =D 0.78 7 d2 - 0.78 X T XIG = 156.8 m 2018

FEBRUARY 2018 MTWTFSS JANUARY 1 2 3 4 6 7 8 9 10 11 5 12 13 14 15 16 17 18 SUNDAY 19 20 21 22 23 24 25 26 27 28 WEEK 01 • 007-358 Nominal Shears strength nnAns+ng nsb ÷8. 1-3111 Gx 156, 8 +0 400 -Sec. 1.1 49 3 FEBRUAR 1.10.51 217.268KN v 10 · sheare streenally es an Ь = 11 1995 222 1mb = 12 317.268 Ξ 1.25 12/10 173.8 KN 11 Bearing Strength APRIL MID e 30 = 0.56 a 0+ *3 30 3×18 14. Smile this 0.25 = 0.861 34 12.1 400 ć = 5 0.98 ab 410 1120 Ju 175 * 6 0.56 1 ILINE Vnpb Nominal beare strength 2.5 k = 2.5X0.56 X 16X10 . = 91. 84KN 2018 X410

2017 DECEMBER JANUARY MTWTFS 8 3 4 5 6 9 10 11 12 13 14 15 15 17 MONDAY 18 19 20 21 22 23 24 008-357 · WEEK 02 25 26 27 28 29 30 31 beare strength (V)= VOP Design Tml 4.8 91.84 4 y 64. 6 -001 1.25 0.9 = 73.5 KN Fore Gros of bolb (V 0 x 73.5 _ 440 KN - 10 nin = 11 Strength o Shearcing ioint= 0) = 173.8KN of holt = 12 (6) 440kr Bearing 148 1.541 of bolt a 8.1 • 2 Earing = 371,952 C of plates 69 = 3 Strength of iom = 173.8KN ie the that can mar be transmitter -5 * Efficiency of Strengton of 1 6in = × 100 joint n = Strength of solid plate - 6 173.8 W 173.8 T=9-409.09 9000 - 173. 8KN .. of thinner plate 1800 x 250 1.1 12 2018 = 42.5% 241

FEBRUARY 2018 JANUARY MTWTFSS 3 4 1 2 7 8 9 10 11 6 5 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 TUESDAY WEEK 02 + 009-356 Calculate the strength of (3 a 20mm bott of greade 4.6 double ain plates 8mm thick Cover 18 main plates are -thick 12mm :9 FEBRUARY 1.8mm s 10 ron = 11 MARCH + 12 for 1 bolt for double n, joint Cover bolts 01 - Shearcing 2 bolts • 2 APRIL d= 20mm 2.0 = 22mm 13 4.6 grade =) fub = 400 & fyb= 240 MPa Nominal Shear strength = n - 4 Int = 5 400 NB = 6 And to 800 ILING 93 Nint 137 12 4 6 2018 16)

TWT М F ŝ 2 JANUARY 3 7 6 8 4 5 9 10 11 13 14 15 16 12 17 18 19 20 21 22 23 24 WEDNESDAY 25 26 27 28 29 30 3: 010-355 · WEEK 02 Anb = 0.78 Id - 0.78 XT × 20 × B 245 mm ⊭9 2 T Asb = - = 10 X X 20 + 11 314.16 mm Z = 12 that I ar 14 245+314.16 " Nominal Shearc = 800 A3 10 = 2 (Vns) b 258,26 KN 2 Ó lotel. = m-* * 3 pesign shearc = Vas)b ds 14.15 A. 1.0 + 5 258.26 SOF 1.25 = 6 206.61KN of botts m - Bearing mit 0 -= 0.5 300 19 310 (b)0.25 = 0.51 fub 2018 • 0.97 D

FEBRUARY 2018 JANUARY MTWTFSS 2 3 -4 8 9 10 11 7 6 5 THURSDAY 13 14 15 16 17 18 12 19 20 21 22 23 24 25 WEEK 02 • 011-354 26 27 28 e=1.5 do =1.5×22 33MM = 50mM FEBRUARY pitch Assume Kb 0.5 + 10 (MP) = 2p 5k at fu Nominal bearing strength #11 MARCH = 2.5 x0.5x 20x12×40 + 12 123KN = 1 (Vnp) bearing strength = Design = 2 APRIL mL 120 +3 1.25 98.4 14 MAY J, bolts 96 FOR = 5 ь 196.8 90 - 6 Shearcing = 206.6KN Streength of bolt (a) mir bearing 19 (1) = 197KN 2018 197 kn =

2017 DECEMP MTWTFS JANUARY 2 4 5 6 7 8 9 11 12 13 14 15 16 18 19 20 21 22 23 FRIDAY 25 26 27 28 29 30 012-353 · WEEK 02 a lap joint to connect two plates 4 Design & 16mm thick using 20mm d 300mm wide botts of grade 4.6. The applied Service - 8 15 J 375 KN load +9 - 10 16mm J IGmm 1.6 - 21 εtt 612 33 1 12 375KN 300 mm > 375k 117 117 - 1 0.125 2.0 33 ۰. 2.' T. Parter 50 1.103. 1 per d= 20mm 1.3 Sara = 22mm - 4 Shearcing of bolts nn=1, ns=D = 5* Nominal V 10-AN nb - 6 fub -0.78 X 202 x 1 NB SP1 400 × 245 14 6-21 -13 2018 56. 58 KN かまで

FEBRUARY 2018 JANUARY TFS 5 MT W 2 4 9 10 11 8 7 6 13 14 15 16 17 18 SATURDAY 12 19 20 21 22 23 24 25 WEEK 02 + 013-352 26 27 28 Design (V) (Vns) b mb 1.18.2 × 8 56.58 1-023 12 3 1 1.25 FEBRUARY : 9 45.26 KN = 10 = 37510 bolts required No. = 15 45.26 KN = 12 8.28 9mos 11 Recei batts e = 1.5do = 1.5x 22 = 33mm 12 APRIL Assume, P= 50mm = 3 (1) min e 0.5 Кb 3do of =4 = 0.51 (ii)) 6.25 3da +5 fub Chil 400 =0.9 410 * 6 (hr) 0.5 (Ynp) = 0 2.5K d.t.ful pearc Nomina 2.5×0.5×20×16×41 =

DECEMBER 2017 MTWTFS JANUARY 1 4 5 6 7 11 12 13 14 15 16 1) 18 19 20 21 22 23 24 25 26 27 28 29 30 31 8 9 SUNDAY 014-351 · WEEK 02 (Jap) Vnp)b design bear 18 Imb 101 * 8 164KN 83 . 62 = 9 32.01 1.25 S.C. , 14/4 = 10 131.2KM ----For 9 mo of bolts = 1180 KN 45 .26k = 11 121 3 6 121 (Design is Safe) = 12 21-3 - 1 Sam P Wind the main - 2 + 3 113 3 n far + 6 A. 64419 15 12.1 e. 5.5 - 5 DIT-= 6 d BY BIDYEC -2018 김 김 김 부가

FEBRUARY 2018 JANUARY TFSS MTW 3 4 2 8 9 10 11 7 MONDAY 12 13 14 15 16 17 18 'n 19 20 21 22 23 24 25 WEEK 03 • 015-350 26 27 28 to angle sect? 150 mm ×115mm ×12mm is to be (5 plate at 12mm thick, gusset connecte +0 CATCRY 0a weld Design the Site = 8 strength of the member qual to -LNZ or = 10 2 Lw #11 Field welding 1 = 1-5 = 12 From steel table, ISA 150 × 115 × 12 #1 978mm (=) 3/16 100 adate UID FILE -44L +2 Cz2 = 27.3mm Design Strength of plate (thimmen) +3 Ln ÷ +4 0.0 15 978 x 250 46.84 . 013 #6 222.272 KM 2018

4 5 11 12 13 TUESDAY 18 19 20 25 26 27 016-349 · WEEK 03 28 to transm Therefore, the weld will be designed equal to 222.27KN force +8 The force to be resisted by the weld of the the lower at = 9 Side angle Fx(L-Czz 10 = 11 222.27 × (50 -27.3 150 = 12 181. 81KM 8.1 the mce. resisted by the weld = 2 at upper side the angle 25000 2.0 = 3 FX Czz +4 222.27×27.3 - 5 150 13.3 ---1011 6 40. 45 KI 1945 2018

FEBRUARY 2018 JANUARY TF S 5 MTW 3 4 2 9 10 11 8 6 WEDNESDAY 14 15 16 17 18 13 12 20 21 22 23 24 25 WEEK 03 • 017-348 19 26 27 28 weld Size o S = 6 mm Assume Throat theckness (tw) 0.75 -4.200 Length Lw, FEBRUARY 1.9 Area = (Lw)(tw) Stress = full3 = 12 Imw (Lw/tw) x fu/13 Pw = Strength = + 11 mw × 12 Lw, × 4.2× 410/13 662.791 P. 12 APRIL w) tw th/13 Pw Tmo +3 4.2× 410/3 14 5 = 5 662.79 Lw 662.79Lw = P => 662, 79 X Lw = 181.81 × 10 $-w_1 = 274.3 \text{ mm}$ = 275mm 2018

2017 DECEMBE MTWTE JANUARY 4 5 6 7 11 12 13 14 15 16 1 18 19 20 21 22 23 8 25 26 27 28 29 30 1 8 THURSDAY 018-347 · WEEK 03 662.79 Lw2 P males 10.00 1 662.79 Lw = B 40.45 ×10 8 Recent GImm +9 2 DOST! 1111 14 į, + 10 C.L.M. (225) 10 6.0 30 # 11 17 2 1.7 長. 14412 * 12 1 ash 1.46 +1 9 C.E × 2 1 × 3 = 4 COH-SARSA 2 = 5 -7 THE PY Sw2 6.6 т Ý. PF 6.63 12 10 01 1 INDO 12.00 00.10 t.

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FEBRUARY 2018 JANUARY MTWTFSS 2 3 4 B 9 10 11 6 7 12 13 14 15 16 17 18 FRIDAY 19 20 21 22 23 24 25 WEEK 03 + 019-346 26 27 28 steel plates of Fe 410grade 16mm thick Two by 24mm dia bolts of 4.6 grade. arce to be yoined Assume a pitch 60mm edge distance of 40 mm. * 8 Calculate Strength of bolt ion (i) Lap i) doubte cover buffield FEBRUAR +9 with 10mm thick cover 1 r 10 t6 mm 28.43 × 12 m 123 Cionm 42 APRIL 16mm #3 1110 1000 *4 fub=400 Given ! D= GOmm d= 24mm MAY -410 40mm + 5 aGmm Case-I S hearcing - 6 $n_s = 0$ $n_n = 1$ LINF $A_n = 0.78 \times d^2$ Nominal Sheare n^{, A}n tub 13 1.451 400 KN 2018 81.521 Y3

DECEMBER 2017 FEBRUARY MTWTFSS MTW JANUARY 2 3 5 6 7 8 9 10 4 6 7 5 11 12 13 14 15 16 17 12 13 14 18 19 20 21 22 23 24 19 20 21 SATURDAY 25 26 27 28 29 30 31 26 27 28 020-345 · WEEK 03 Nominal Sheare design sheare = 1.25 8 81. 521 = 1.25 9 65.21 KN = 10 10 Bearing r 11 - 11 0.513 40 = ct 3×26 0 17 = 12 min 12 K_b 11 = 1 0.25 = 60 _0.25 (i 2 310 3×26 2 + 2 0.52 « 3 =3 fub (iii) 400 + 4 416 14 601 - Juli (iv) 1 Dist C. = 5 0.0001-= 6 nominal 2.5 K.d.t. tu ×.6 Dear 18 2.5×0.513×24 Canal . 14 × 16× 410 4. 201.92 KN 1200-2018 c'V

2018 FEBRUARY JANUARY MTWTFSS 2 3 4 1 8 9 10 11 7 6 5 12 13 14 15 16 17 18 SUNDAY 19 20 21 22 23 24 25 WEEK 03 • 021-344 26 27 28 Design bear ml # 8 201.92 1. 2 14 1.20 FEBRUARY 1.25 ×9 161. 53 -±.10 bolt = 65.21 KN Strength of × 11 Case - 11 butt joint Double Cover = 12 bolt ne= = 1 Fore 1 1), S. 11 A = 0. 78 7 42 APRIL Mim 2 bolts 452mm 353 mm2 - 3 tub Nominal Shear (V, +4 MAY + 5 1×353 400 +6 185.9 - 371.8 KNX2 IUNI (Vns shear Design 297-KN 1.25 18.7KM bolt design shear pere 2018

2017 DECEM JANUARY MTWT E 4 5 6 11 12 13 14 15 MONDAY 18 19 20 21 22 21 25 26 27 28 29 30 022-343 · WEEK 04 bearing / will LAP be Same ser 53KM iner! = B 150 Streng bolt = 148.7 KN = 9 ъ 151 = 10 1. = 11 100 -21 7 . + 12 = 1 67 58 42 A. ń. 0.33 13 1 713 110 = 5 272 64 24 2.5 = 5 COP-• 6 F - Sk Wa 1. -81 mx in a -~S 1800 0.124 30

2018 FEBRUARY JANUARY MTWTFSS 2 3 4 8 9 10 11 TUESDAY 12 13 14 15 16 17 18 19 20 21 22 23 24 25 WEEK 04 • 023-342 26 27 28 Design a suitable fillet weld to comec tie (barc 60mm × 8mm to a 12mm thick, gusse plate so as force develop maximum D is done on 2 side a) shop welding FEBRUARY field welding is done on Isides (11) × 9 200 + 10 1351 +11 60min X Smm = 12 =1 60×8)×250 Strength of weld = Given: ÷2 APRIL 109 KN mo . Shop welding mu = 1.25 Case -T plate thickness - 8mm 14 > Min weld size = 3mm MAY +5 Max weld size = 8-1.5 = 6.5mm ⇒ € Adopt of weld s=6.5 Size KIS tw= 0.7× 6.5 = 4.55 Lw 2018

2017 DECE MTWTE JANUARY 4 5 6 11 12 13 14 15 16 18 19 20 21 22 23 25 26 27 28 29 30 WEDNESDAY Area = Lw. tw fu/13" - 4. 55 to lu mw 18 410/13 = 9 -1.25 10 = 189.4KN Strength of weld = Area x Stress = 11 4.556 × 189.4 = 12 = 861.644 = 1 109 × 103 = 861.64 W + 2 126. Gmm lu = 1 63mm +3 atolit 11. 101 (493.) K-63 1.2 C1116 - 2 -2.00 1 Sec. τ. K-63 2.454 S. A. Car aa. 2018

FEBRUARY 2018 JANUARY -MTWTFSS 25 2 3 4 1 7 8 9 10 11 6 12 13 14 15 16 17 18 THURSDAY 19 20 21 22 23 24 25 WEEK 04 • 025-340 26 27 28 field welding mw = 1.5 Case - II Strength of weld = Area & stress 0 B = Lwx 4.55 x fu/v3 49 1.5 = 10 718 LW = +11 => 109×103 = 718 LD = 12 Lw = 151.8 mm lw,+60+1w=152 -1 ⇒ Lw,=Lw2= 46mm = 2 - 3 16 -MAG - 4 = 5 14 46 +6 2018

FEBRUARY 2018 JANUARY E š S 2 3 4 9 10 11 8 5 SATURDAY 15 16 17 18 14 13 12 23 24 25 22 21 WEEK 04 • 027-338 20 19 26 27 28 -日月 1.1 e 10 Given. Service = 20KN D. load OWNER 50KN 611 Safety factor =1.5 Pa, mb 12 1.0 fu = 410, fy = 250 Fe 410 = 16 =18mm d = 16 + 2 fub = 400 N/ 2 - 2 Grade 4.6 => 217 • 5 = 240 N/m 14 = 1.5 DL + 1.5L Design Doad actored - 5 1.5×20+1.5×50 SIL-11 2 mill 1.6 105 KN -05210 410

2017 DECEME MTWT JANUARY Ē 4 5 6 11 12 13 SUNDAY -14 15 18 19 20 21 22 028-337 · WEEK 04 25 23 26 27 28 29 Tension members failure = 8 block shearc Rupture Yielding = 9 Ag Yielding Strength X = 10 dC mo = 11 105×103 2. 19.11 -250 = 12 A. 462mm2 304 = 1 = 2 4:034 115x4 121/2 K *.3 0 DOP5 3, = 4 - 1 3 7 vl arrest rich-= 5 Rupture strength -63 X 40 O. 9 An dr fu - 6 Tmb 201 30 105×10 = 0.9 A . 1.25 $A_{\eta} = 355.69 \text{ mm}$ 2018

FEBRUARY 2018 JANUARY TFS S MT W 2 3 1 4 8 9 10 11 7 -6 5 12 13 14 15 16 17 18 MONDAY 19 20 21 22 23 24 25 WEEK 05 • 029-336 26 27 28 PlAssume) thickness of bare = 4mm width of -bar = A-a 4 mm 10.61 =8. . 462 Andrews 4 = 8 115mm = 10 An = Check : (b-nd,)t 1 = 11 115-1× 18 4 mm = 12 355.69 mm2 388mm Safe) ï = 1 Ana 180 Effective slendemess vatio 1 IL+LL leff = 2 -350 WLIE 100 *3 T Tensik A = 4 6t3 12 1 = 5 0 115 × 43 = 6 12 115 1.15mm 8 m= 800 mm eff 2018 ۰. ÷.

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2, 2017 DECEME MTWT JANUARY 4 56 11 12 13 14 15 18 19 20 21 TUESDAY Ş5 25 26 21 33 28 27 29 030-335 · WEEK 05 695.65 < Aman = 180 (Not safe) 800 1.15 y * 8 Redesign # **9** = 10 1. 13 herei = 11 and -2 31 = 12 \hat{r}_{j} HER MAN =1 0.21 *2 144 withen ft - - 2 #3 1 = 4 134 -* 5 + 6 14 211 52 1 904 10.12 2018

FEBRUARY 2018 JANUARY TWTF55 M 3 4 2 1 7 8 9 10 11 6 5 12 13 14 15 16 17 18 WEDNESDAY 19 20 21 22 23 24 25 WEEK 05 • 031-334 26 27 28 100 000 m tension member con 30 Connected hich hick OU Oma = 5 in DOLCH Orm. n.f 3 man Tranne 1.9 Fe410grade Etep Sa C a terril 40 107.11 Les 406 helt + 10 20018 Griven Eneone Strength e.11 = 12 1-=10 mm) = 8 mm 41 2 c al-1 LOOMMA & MM = 2 Hall 5 22.13 = 3 38 05-5 de 120.94 所属 s alanti 1.5 L Yielding Strength =5 mo = 6 14/23 (Hund ? work) al de tites (100 × 8) ×250 1.1 CREET XARTISH SITE-= 181.81 KN ELF Y COARKE.S 8 - V. 2018 72. 2. . . 1 ...

2018 M Ŧ W FEBRUARY 2 з 5 8 9 10 11 12 15 16 17 18 18 19 25 26 22 23 24 27 THURSDAY 29 30 31 032-333 · WEEK 05 = 0.9An fu Rupturce strength Vint +8 = 0.9 × (100 - 1× 18 1.9 193.65 KN - 10 Block shear Strength 113 1110 + 11 = 12 T 50 11 K3× 40-> • 2 GrossArea area +3 (30+40)X8 Sheare = Shearc (7-0 - 1.5xd) = 4 (\mathbf{I}) 560 mm2 70-1.5×18)8 tension -50.x8 2 + 5 344 mm Tension - (50 + D.5XB 400 mm2 * 6 328mm Block Strength) = (Grossshear) fy V3 Yr 0.9 (Net Lension ma m 1031 1.54 2018 ÷ Sec X

2018 MARCH **FEBRUARY** MTWTFSS 1 2 3 4 7 8 9 10 11 5 13 14 15 16 17 18 FRIDAY 12 20 21 22 23 24 25 넹 WEEK 05 • 033-332 26 27 28 29 30 31 = 163218.29 N 11 12.0 1. 0.9× (328)× 410 560 × 250 1.25 13×111 69 170.31KM 0.01-= 1D (400)× 250 Block Strength) +11 n 12 0.9 x (344)x 410 13 4月1日第一日日,日本市、日本市、日本市、日本市、 .25 The start was de allert DEL VEC 149. 54KN = 2 of tension members 1 Strength min of Yielding 181-SIKN (i)14 (îì) rupture 193.65th • 5 (H) d soft D Block shear 149.54 *6 140 = 149.54KN 1.1. 1718 IT IS DOWN in a rate Sin Sect 2018 2条火力| と 目出, 5 下さ・ 1.1.1.1.1.1.1.1.1

2018 Areas MIW FEBRUARY 2 3 8 9 10 11 12 11 8 9 17 18 10 01 1 15 16 17 18 10 00 0 22 23 24 25 26 27 2 SATURDAY 034-331 · WEEK 05 Strength of bott N.F. σ n An to tub Design shear N3×1.95 × 9 MX18.0+1 O.JAT Xd2 400 = × 10 13×1.25 GET X GOA = 11 diana = 12 OIPXPPEXP 0 =1 58 Designshear per bolt Da KN 12 SAR C-1-+3 Korad. (b. e 23/19 30 -0.55 300 3×18 to rin 112-181 12 0.25 = 40 -07 3×18 6.19 m fub 400 =0.9 - 6 anterio dividi Cin Su 410 KB = 0.491 Design bears strength = 2.5Kgd.t. fu 2018 = 2.5× 0.491 × 16×8×4 51.54 kN 2

MARCH 201B M 1 W T F S S FEBRUARY 2 3 4 1 8 9 10 11 7 6 12 13 14 15 16 17 18 19 20 21 22 23 24 25 25 27 28 29 30 31 5 SUNDAY WEEK 05 + 035-330 Bolt Strength ĉ. min (i)Shear = 291 48 Bear , 51. 54W (2) ÷ e 12 29KN -+ 25 Bolts = 2×29=58KN 2 - 12 Max load joint can carry +5rin Detrength of tension _ 149,54 member 12 63 strength of bolt = 58 KN II) + 4 58 KN -15 ÷ fi 2018

2018 MARCH FEBRUARY MTWTFSS 1 2 3 4 6 7 8 9 10 11 5 12 13 14 15 16 17 18 TUESDAY 19 20 21 22 23 24 25 WEEK 06 • 037-328 26 27 28 29 30 31 Design a steel column section resing only to carry channel. section a factored load of 400KNS Column is × 8 effectively. held in position Long against ends but restrained both = 9 only Consider restation at one end earthquake at Wind fv = 250MPa ans ume = 10 Chamel Section = 11 i Assume × 12 350@4131 design compressive ISMC. trass 80MPa fcd = 80MPa +2 ñ Arrea +3 read +4 fed Sile . ドち 400×10 1.316 1.011 = 6 80 = 1 500 0 mm ISMC 350 ag m Area = 5366mm 2018

2018 MTWT FEBRUARY 2 3 9 8 10 11 12 13 15 16 17 18 19 20 WEDNESDAY 22 23 24 25 26 038-327 • WEEK 00 29 30 31 Yyy = 28.3mm Column ; NZZ 136. Bmn 9 min : 28. 3mm .» (fii othes fixed 8 end erd pin, Forc one eff = K·1 10 510 -0.8 0.8 × 4000 = 11 3200 mm 32 Stenderness ratio 2 Leff min - 3200 ×2 28.7 Amon +3 113.07 Design Safe) - 4 Channel Section => bucking class C ly Forch: KL = 113.07 - 6 fy = 250MPa By Interpolation method ->113.04 110 4.6 2018 120 83 7

Interpolation in for-991ES Calculatore 2018 (i) Mode - 3-2- Values - AC 5 5 (ii) (Write no)- shift +1 - FORUASY)- enter MARCH 2 or 5 -3 9 10 11 -6 12 13 14 15 16 17 18 19 20 21 22 23 24 25 25 27 28 29 30 31 fed = 91.25 N/mm Design Strength P = A. fed = 5366 × 91.25 = 9 (0.K.) 489.65KN > (400KN +10 for limiting, thickness Explain * Check <11 250 =1 =) ==1 250 +12 from steel table 6, - 100 mm 350mm 17 = 13.5mm = 8.1mm ×2 R = 14mm 2.05YA Here, b= 100mm +, + R, d= h- 2 -4 = 350-2(13.5 + 14) -5 295 For channel Section Acrest = 12-35 < 100 15.78=15.7 0.k. = 36,42 < 428 = 42 295/8-1 2018

2018 M 10 w 3 FEBRUARY 9 10 15 16 17 22 23 24 25 FRIDAY 29 30 31 040-325 · WEEK 06 Calculate the design compressive load 4m high The ISHB 250 @4 536 . G N/m an column is restrained 1.1 is to both the ends. only at as an uncased column in ed stoney puilding? single 1 10 Given: 15HB 250@ 536.6 Nm L = 4m- 11 column is restrained at both the thes. Leff = 0.656 ends 112 steel Tableon slaning pola mor From h= 250m - 1 = 250mm 7 Area = 971mm 250 <1.2 250 9. 7mm 100 mm 1.5 Clay Buckling about 2-2 unis = = 5 axis = C 5.01 2018

2018 MARCH FEBRUARY MTWTFSS 2 3 4 1 8 9 10 11 7 6 SATURDAY 12 13 14 15 16 17 18 19 20 21 22 23 24 25 WEEK 06 • 041-324 26 27 28 29 30 31 compressive stress Design ÷B About Y-Yakis About 2.2 anis + 10 ratio Slenderness Slenderness ratio Leff-+ 11 Nonin Azz=ler KL Min Tz2 = 12 0.65L -The set =1.65 x4 x10 11 107 0,65X4710 = = 24.29 = 2 fy = 250 N/mm2 53.7 Forc , -= 48.41 3 Buckling Class b For ty = 250 MPa Buckling Class - 4 ted Mmm2 fed Mmm2 Ay-y 2.2 *5 00 40 198 225 20 * 6 48.41 24.29 183 ZiG 50 30 183-198 Y-198 Y2- J1 50 - 40 48,41-40 185.3 Mmm = (x-x1) 225= (24.29-20)-0.9 Þ 2018 mm

2018 FEBRUARY M W 1 2 3 4 5 5 8 9 10 11 12 11 15 16 17 18 19 20 22 23 24 28 28 27 29 30 31 SUNDAY 042-323 • WEEK 06 Design Design Compressive compressive Loat - 8 P Pa col A a ca = 6971 x 221.13 = 06971×185.3 -1541. 5KN 1291.7 KN × 10 Design Compressive V Da = 11 1 nin 1541.5 KN + 12 5 ī - 1 1291. 7 KNS 1235.0 22 1291. TKN - 3 21 214 129ak 2.4 19 -15 -Stars 24 - e ۹., 012 2.0 19 Ching V 2018

2018 MARCH FEBRUARY S W T F S MT 2 3 8 9 10 11 7 6 14 15 16 17 MONDAY 18 13 22 23 24 25 19 20 21 WEEK 07 + 043-322 29 30 31 26 27 28 steel column using channel Section Design a axial loas of 350km Carren tored ac posit? & thestand effectively 15 column = 8 against Hestraineo ends. Take fy = 250 MPa & assume at both wind/ earthquake actions = 10 Given . P = 350KN +11 eff = 0.651 Restrained at both ends = 250MPa 12 Channel Section (buckling, class'e') (i) Assume design compressive stress = 80MPa = 2 for Chanel f = 80 MPa 13 08 201 1 10 +4 rego CA = 5 350 × 10 80 *6 2 4375 mm 351.2N/m havin 300 2) ISMC Adop = 456 4 mm ? area A 2018

2018 JANLIN FEBRUARY MTWT F S 2 3 6 8 9 10 11 15 13 15 16 17 TUESDAY 18 19 20 22 23 24 25 26 27 044-321 · WEEK 07 29 30 31 $\gamma_{zz} = 118 \cdot 1mm \qquad \gamma y = 26 \cdot 1mm$ Column ; N 26.1 mm ทเก ٢ Stenderness matio 9 - 9 Lefe min = 10 3.54 0.65 × 3.5×10 = 11 26.1 del. 311 - 16 12 87.165 250 - 1 Design sa 112 fca HECH (1)13 HM CK 80 130 87.105 1093 90 15 the state 121 NYARS - 6 Y-136 = 121-136 87.165-80 90-80 => Y = 125 . 25 N/mm2 Relate 2018

2018 MARCH FEBRUARY NTWTFSS 2 3 4 10 11 9 в -7 6 WEDNESDAY 5 15 16 17 18 13 14 12 20 21 22 23 24 25 WEEK 07 • 045-320 27 28 29 30 31 125.25N/ mm Co 4564 × 125.25 > 350 KN 571.65 KN Design Safe) 11 * Check for limiting thickness =? 27 250 250 8 250 $h = 300 \, \text{mm}$ 12 APRIL gomm Gmm - 5 · Gmn = 13 mm 14 Here, b= 100mm - 5 $d = h - a(t_f + R_i)$ = 300 - 2(7.6+13) - 6 = 246.8 mm sect b=bf For channel 90/13.6 = 8.60 < 15.7E = 15.7 (0.4.) 246.8/7.6 = 32.47 < 428 = 42

2018 MARCH FEBRUARY WT F. 2 9 10 11 8 7 FRIDAY 14 15 16 17 18 20 21 22 23 24 25 WEEK 07 + 047-318 26 27 28 29 30 31 a stab base of column JSH13 2000 Design 365 1 N/m Subjected to a factored load of 400 KN M20 concrete is used for foundation Provide welded connection bet column & base plate. Given 10232 × 10 Column I ISHB 200@ 365. 9 N/ DE=200mn Arial load = 400KN + 11 Assume Allowable pr. intensity 5 = 4 N/mm * 12 bearing stress of = 1851/2 a are Step-1 APRIL Load = 400KN 400 × 103 100000mm 13 regd = 350mm Base plate: 1 300mm 350x 300 = 105 000 mm2 A provided P=2 W. Upward pr. = Load Provided Step=2 400 × 103 STAN OF 105000 72801 6 2018 O.k.) = 3.8 N/mm

FERROARY 2 3 8 Q 10 11 12 13 17 18 19 16 15 20 22 23 24 25 26 SATURDAY 27 29 30 31 048-317 · WEEK 07 Thickness of base plate Step-3 a 3W × B B 5 c 9 - Greater projection beyond a ace = 10 \mathbf{D} B 2127 - 11 2 LI D 12 350-200 COLLE 240sto R1 11-1-MILLITUS C 1.11 75mm -×2 Smaller project beyond colump REFERENCE 01 BB - D 2 14 · MAG 24000 300. -200 105 000 BGL 030 10000 50 mm 2 16 TB 10 tel. 752 3X 3.8 50 10 11 4 17.55 mm ~ 40mm plate = 330mm x 300 mm x 40mm Base 2018 Use 150 mm × 150mm × 8 mm cleart angl

2018 MARCH FEBRUARY WTFSS MT 2 3 4 6 7 8 9 10 11 12 13 14 15 16 17 18 SUNDAY 19 20 21 22 23 24 25 WEEK 07 • 049-316 28 27 28 29 30 31 Design a slab base for a column ISHB 855. 4 Nm. ascial factored to CARTER al is used M-30 condret for the foundation, Provide welded connection base plate column between 8 Given : ISHB 450@ 855.4 N/m + 10 P= BOOKN ant States and M30 concret SEC THUN :11 a famer can the = 0.45fck Bearing strength of concret 12 = 0.45 × 30 = 5 13.5 N/mm 12 APRIL Properties ; 6, =13, 7mm 53 9.8mm/ Omm + £ . mm stepfor slap base K 500 arcea read 8 A rega = 150 0x 103 SPE A 3.5 STA BA = 11 11 1 11 mmm 2018 COP CAS

FEBRUARY 2 э 9 10 11 15 16 17 18 19 22 23 24 25 25 27 MONDAY 29 30 31 050-315 · WEEK 08 Let's provide square pase plate L= B= of Arcea = 8 11,111.1 >450 -= 9 333.33 mm. 17 250 420thm = 10 420 mm x 420mm 2n Provide a base plate 300 mm 500X Size . concrete bearing pressure = 12) W= A 1.1 = 1 1500 × 103 1500 ×10 = 2 4202 420 500× 300 *3 T 52.22 10.8005 N 13.5 (O.K) mm 2 C Carlot New Med R 25 reales = 5 rejection 500 2 950 400 = 6 25 b = Smaller projection = B-b 0.0 2 150 420 300-250 1010 11 -2018 15mm 25

2018 MARCH FEBRUARY NTWTF S S 2 3 4 9 10 11 8 14 15 16 17 18 TUESDAY 13 22 23 24 25 20 . 21 19 WEEK 08 + 051-314 26 27 28 29 30 31 2.5w (a2 - 0.3b2 no Slabbase = Ş 252-0.3×252 1.1 13.7 6.47mm CODEE D = 1 1 25 # 10 Adopt tsb = 15mm +11 500mm x 300 mm × 15mm Slab base * 12 Step - III 1 - column to the base plate Connection 8fillet weld ׿ Shop welding mw 13 Total length Welding + 4 250 + 250= 5 OIC 250-9.8 250+250+ (250-9.8) *6 90- Qx13.7 dianes 1525. 6mm IX 2 2018

М W FEBRUARY π Ë 3 1 2 3 4 5 6 8 9 10 11 12 13 17 18 15 16 19 3 WEDNESDAY 22 23 24 25 26 27 30 31 052-313 · WEEK 08 29 1825.Gmm 1525. 6mm 75 - 8 0. 197 Area U) ÷9 Stress = fu/13 13 Tmu = 10 25 2 20 Stress 525 16 X 0. + S = 12 1\$25 . 0. :* 5. -11 1 1 = 1 N2 :: 1. 25 24644 2.92 1 2 216 137. : 75 Northall × 2 P = 20202009S 500 Y 10? * 3 20:23 95 9 = 3.1. 2. 21 - 4 Minm weld size for 15mm plate 5mm + 5 Magm ,, 15-1. 13.5 Adopt Size of * 6 weld = 8mm No. of total end seturn s=12 Effective length of weld w) cff AUCI 182 5.6 2X8 X12 1833. 6mm = 2018

2018 MARCH FEBRUARY S S TW M 2 3 4 9 10 11 8 7 6 17 18 15 16 THURSDAY 13 14 12 19 20 21 22 23 24. 25 WEEK 08 • 053-312 26 27 28 29 30 31 tw= K.8 = 0.7X8 = 5.6mm Area vistroy Weld strength mw - weld strength x 10 1500 × 103 = 40×5.6× 410. M3x1.25 11 1333.6) = 1414.46mm-LA) = 12 Required Revision 111 12 523 1776 = 1 re=10mm weld - (2×10 ×12 w)eff 525 × 2 OTXIO) × 410 1500×103 = 3 .13×1:25 42 w) (0.K) 1131. mi 64 42 CALE 6 1308 X0001 +5 0. K.) (Lw) W Rego = 6 REERS 6100 38 Sace Polate Spiver A MAR DOLANS! 2018

FEDRUAIII 8 10 12 ħ 15 16 17 18 19 25 26 22 23 24 30 29 31 054-311 · WEEK 08 for a column slab base Design a Subjec TSHB ¥10.2 a 25 concre Dea = 8 Porovide welder tound ation -be Usec by lumo Sal between connection # 9 Tr = 11. Gow + 10 Given 710.2 N ISHB 350 (a) m P = 1500 kme.11 MQ5 = 12 Bearing B-to-ength σ = 2 ≥3 Gita 0.45 × 25 11.25 Mmm = 4 118 Slab base = 5 1500× 103 11.25 × 6 133333,33 mm Provide base plate 42.0m 300 mm $A = 134400 \, mm^2$ 2018

2018 MARCH TWTFSS FEBRUARY ' 2 3 4 8 9 10 11 7 6 13 14 15 16 17 18 12 SATURDAY 20 21 22 23 24 25 19 26 27 28 29 30 31 WEEK 08 • 055-310 S me 20 0 000 11.6 10.1 1 al box 320 250 350 420 a 10 23 + 1 = 11 Step- 1 W menter Par 4 = 12 111 1114 - Murzel Stall Ware = 1500×10 Hell to allow e1.0.0 134400 still're 11.16 N/mm2 12 82. X \$.0.= 中于之内。 Cath Step-11 = 3 El star -20.20 420 - 350 = 35 a= +4 2 = 1500001 P 1924 +5 CLEW? 320 - 200 01 2 00 35 0110 = 2 REVIXEV + 6 g.5w (a2-0.3b2 The mar iver tob Sy XELCI-VAL 2.5x 11.16 × (352- 0.3×352 1-1 12、日月月 ---250 10.26 < 11.6. 2018 tab 2 1200

FEBRUARY 2 1 3 8 9 10 15 16 17 18 22 23 24 SUNDAY 30 29 31 056-309 · WEEK 08 420mm X320mm X 12mm Slab base Available weld length 18 250+250+ 250-10.1)+(250-10) = 9 + 350 - (2×11.6) - 10 +350 - 6×11.6 = 11 1633,4 mm - 12 Plate 12mmg Min weld size = 5mm 21 Maam 2> = 12 - 1.5=10 9) Adopt; weld size = Gmm 62 = K.S (Lw)eff 1633.4 H'rar. = 0.7×6 1489 1.3 4.0 = P= weld strength 64 -) 1500×103 fu/13 tw = 5 1500×103 = 40×4.2×410 × 6 N3×1.25 =) -w = 1885 Revision not. o.k.) S = 8mm tw = 0.75= 5.6 (1258 = 1633.4 - (2×8×1) 1.97 Oc. 1441.4 2018

2018 MARCH FEBRUARY S WTFS MT 2 3 4 1 9 10 11 8 7 6 12 13 14 15 16 17 18 19 20 21 22 23 24 25 MONDAY WEEK 09 • 057-308 26 27 28 29 30 31 P=weld strength =) 1500× 103 = LWX tw X falt3 8 mw 1500 × 10 = 19 LW X 5.6 X 410 N3 × 1.25 = + 10 (O.K. =) 4w = 1414.5 mm +11 eff - 12 +1 +2 13 4 1 = 5 +6

2018 MARCH FEBRUARY WTF 10 11 9 8 13 14 15 16 17 18 WEDNESDAY 19 20 21 22 23 24 25 EEK 09 + 059-305 26 27 28 29 30 31 laterally supported beam ISMB 600@ 1202.71 is placed d between two supports. Determine # safe uniformly distributed load the beam careray for an effective span of 10m. Ta web creppling. Neglect web buckling & a 10 -W/mlength : 11 mmmm 600 0mwt of beam e 12 = 1-202 ISMB 600@1202.71N/ = 2 Step. I: (Section Properties) = 3 For ISMB 600@ 1202.711/m = 3510630 mm³ Plastic Section modulus Zp = 3510630 mm³ Depth of section h= Goomm r, = 20mm With of flonge b, = 210 mm = 5 + 15621mm Sectional Area Thickness of flange the = 20.8 mm ۰đ Thickness of web = 12mm Depth of web d = h= 2(tf+r) = BOD - 2(20.8+2) = 518.4 m Moment of inertia about 2 axis 4 I 22 = 91813 × 10 mm9 Elastic section modulus Z 01 Z = 3060. 4 × 103 mm3 2018

MARCH 5 6 7 8 9 1ŋ 15 16 1) 12 13 14 22 23 19 20 21 26 27 28 SATURDAY 062-303 · WEEK 09 Class Fication Step-IL Sect? =)8=1 250 250 E = 250 = 8 = 9 Here, b #2 210 105mm × 10 For rolled section, * 11 out stand of compression frange 105 (9.48 ь 5.05 < 12 Îf 20.8 +1 plastic Section 28 Flange = 2 Web with N.A. at mid depth 518.4 - 43.2 (81 = 3 tw 12 * 4 => Web is plastic section = 5 Hence Overall Section i Plastic (class-= 6 2018

2018 NPRIL MARCH S S E W T 1 8 6 7 5 4 3 ź 14 15 10 11 12 13 9 18 19 20 21 22 WEEK 09 • 063-302 17 15 26 27 28 29 25 bending, strength esign -111 43.2 678 < 0 t Assume < 0.6V IS-20 1.220 + 10 1 mo for plastic section ivmo : 12 M 1× 3510630 × 250 1.1 +1 97.87 KN-m staine. 511000 111 ±2 APRIL 1-2Ze Ym +3 1 256 1.2× 3060,4×10 × = +4 1.1 1/± MAY 834. 65KN-m ۰5 0.K.) MI *6 Ymo JUNE 01 197.87KN-m 2018

2018 FEBRUN MTWT MARCH 5 6 7 12 13 14 15 MONDAY 19 20 21 22 23 26 27 28 064-301 · WEEK 10 esign Moment & Load Carrying. Capacity Step-IV w12 Design - 8 momer 8 WX102 1.9 8 = 10 = 12.5Wu 12-50 = 797.87 - 11 . 83 KN m Working = 12 w Load W= 63.83 • 5 1.5 +1 42.55 KN/ m Safe * 2 working loas the beam car carry Self • 3 beam +1202.7N 42.55 - 1.202 - 4 41. 35 KN Step-V Check m forc Shearc 100 10.05 Factored Shear V = - 6 wi and 63.83 × 10 -319.15KN 2018

2018 APRIL MARCH WTFSS N T 1
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TUESDAY WEEK 10 + 065-300 23 24 25 26 27 28 29 shearc storing sign V3 mo 250/13 GODX12 12. 10 V (O.K.) 944.75KN DY 0.6× 944.75 566.85KN 0.61 > N(0.K.) + 13 from deflection capacity 00. Carcre criteria -13.5.bear Span Spermissible Sman For 5 W , Ud 4FTT elastic clading APRIL WL3 Span 300 pant permissible Smark 48EI Vad 10,000 int 5x w x (10,000) Spermissible 240 MAY max 38 × (2 × 105 XIZZ = 41.67m 5 Wh (10000)9 38 × 2×105×91813×10 16 0.709W JUNE 2018

2018 FERR MARCH MTW 5 6 7 8 12 13 14 15 16 17 WEDNESDAY 19 20 21 22 21 24 066-299 · WEEK 10 26 27 28 0.709W' = 41.67 58.77 Nmm W'= 58.77 KN > Or 4 B Working w loce W = 1.5 19 2.21 - 0.0 39.18 KN m = 10 Sale working load Struc w wt. 50 11 . 202 39.18 37 38 KN 12 ÷, m ÷ • 1 1.8.5 (2) *2-5 HOL ... MTTP 21 ROM in the suited a +3 ALC: AND STATES *4 1 100 5 1021 +5 000 03 A land * 6 of the rate of 1150

2018 APRIL MARCH S NT Ϋ́, W 見い日時記 8 5 Ģ 12 13 14 15 10 11 THURSDAY 19 20 21 22 17 18 24 25 18 WEEK 10 • 067-298 27 28 29 26 ective Simply e Design a 3.5m Span Drei ma aterally sum 300 KO Step-1 · 10 Mar Moment bending 2.5m w 捕 300×103 N-mm 10 .5x 2 BUN = 12 80-1 XID N-mm 187.5 1 11-1-10 YEU Manto ----Shearc 45 = 2 14 W 2 12 RUS 300 a - 150KN or 150×103N Sec. Plane +4 51---65:33" =5 1 mo M Z, Keg *6 187.5×106×1.1 825×103 m 3 ž. mm = 2018

2018 MTW MARCH 5 6 13 14 12 15 22 FRIDAY 传 20 21 19 23 27 28 068-297 · WEEK 10 26 Step-II 0.486 KN/m ISL8 350 @ Adopt 165mm = 8 350mm = 9 11.4mm . 4mm I = 10 16mm depthotweb +R1 51.8 = 11 Plastic Secto 295.2mm STO hange 05/2 165/2 11.1 0, 1/tw =2 Neb 295-2 40 848 - 94 (01 4. * 3 I 22 = 13158.3 × mmf - 4 Sect modulus $X_{22} \text{ or } Z_{e} = 751.9 \times 10^{3} \text{ mm}^{2}$ $Z_{p} = 851.11 \times 10^{3} \text{ mm}^{3}$ +.5 × 6 197 dvacs 2018

2018 NPAL MARCH WTFS S 8 6 7 5 3 SATURDAY 15 12 13 14 11 10 20 21 22 18 19 17 WEEK 10 • 069-296 25 26 27 28 29 24 Check fore Section step-Bending M = 187.5KN-M moment ~ 190KN-m (Zp) regg M mo A +10 ar while h 190×106×1-1 +11 250 = 12 836 × 10 mm < Zp=851-x103 0.1.) +1 (mg for sheare Step- N Check APRIL V.= 150 KM = \$ CONV. htw MX 3.C Ymo • 4 OLX & X SI 350x 7-4 250/13 15 MAY 1. 340KN > Y (0.K) 0.6V = 0.6 ×340 JUNE = 204 KN > V (o.k.) 2018

2018 FEBRI MTW MARCH 5 6 12 13 14 15 16 17 19 20 21 22 23 24 SUNDAY 26 27 28 070-295 · WEEK 10 capacity Sectin -01 for design Step-V Check 678=67 = 40 ×8.1 1. 2. 2. 0 14w 123311 ·2Ze + 9 mo = 10 ×851. 11×10×250 < 1-2×951. 1 (=) 11 1.1 C 193.43 KN-m < 20.5 KN-m • 12 Step-Vi Check for deflection 29.5. beam X point WL3 2 march 48EI Load +3 150 201 RAD 2.5×10 300 WO 14 n'r 48 × 2×10 × 13158-3×10 54.9 VOBR VORE 300 x 2.5 x = 6 48 ×2 × 13 158-3 × 10 0) V < MACHE 011EX 9-0 = 3.7 mm A SOURAL > Y GOLA 2018

2018 APRIL MARCH WTFSS M.T. 12 t 30 8 2 3 4 5 6 7 8 9 10 11 12 13 14 15 15 17 18 19 20 21 22 23 24 25 26 27 28 29 5 6 7 MONDAY WEEK 11 • 071-294 3 Span permissible ----300 ٢Ē 2-5×10 300 = : 9 8.33 + 10 5 3 Design O.K. permissible max +11 + 12 ų, = \$ • 2 $\mathbf{\hat{r}}$ *3 . +4 15 *6

2018 APRIL NTWTFSS MARCH 30 5 6 7 8 4 - 3 2 10 11 12 13 14 15 NEDNESDAY 16 17 18 19 20 21 22 9 WEEK 11 • 073-292 23 24 25 26 27 28 29 Rec column a square fooling for Design a × 350mm (carerying a load 350m 500kn. The SBC of soil Vist 120KN/m2 Th 18 materials are M20 concrete & HYSD grade Feyl5.1 reinforcement ot K Lr = 2700 mm + 12 = 11 Bf = 2.7m 350 = 12 350 500KN 12 +3 1.2 load = 500KN column loud foundation Step-I imn Total load - 500KN 500KN 01 • 6 500 KN + 50 KN 550KN 1.5 × 550 Ultimate Load TIN 825 KN m2 ultimate Load Arcego 825 SBC of Soil 20 ECH TIOSM 01985 2018

2018 M T MARCH 5 6 12 13 14 15 16 17 1 THURSDAY 19 20 21 22 23 3 074-291 · WEEK 11 26 27 28 Br = Adopt 2.7m 2.7-00 7.29m2 area - - 11-----Upward Pressure (9) * 9 Load + 10 Af = 11 St. Comm = 500×1.5 + 12 7.29 1.1 = 102.88 N/ < SBC. of Sail=120 = 103 N/mm² mm² (0.K.) Bending Moment Calculation 2 Step-11 0.K.) 1.3 9B (B-b V 8 -4 103 x 2.7 x = 5 rada 2.7-0.35 191-97KN - manp--6 indiana 10 5 11 SOCKE Step II Depth Calculation M = 0.36f nu man DVY! 4224 2.63 b M201 Fe 415= 0.480 2018 Huyman

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2018 APRIL MARCH TFS S W 8 6 13 14 15 12 FRIDAY 19 20 21 22 26 27 28 29 18 WEEK 11 • 075-290 25 .42 X0.48 × 0.48 91.97×10 0.36×20 2700 22 × 160 mm di= =) I Twice Take = 350 mm 0 footing effective cover = 350+50 D= 111 7/ 400mm + 12 Steel Calculation Step-IV +1 = 0.87fy Astd Ast • 2 APAN => 191.97×106 = 0.87×415× Ast 350 × 13 7415 Ast × • 4 X26 2700×350 20 15 1 - 21.9 × 10 Ast AG 7 1519.14 = A - 21.9 ×1062 16 1519.14 Ast 21.9×10 AL 1519.14 =0 + - & 44088 mm 2 mm 1573.35 Ast = 5 4157

2018 MTW MARCH 5 6 15 12 13 14 15 16 17 19 20 21 22 SATURDAY 26 27 28 076-289 · WEEK 11 新水田市市 Reinforcement Main Preoxide, 25mm of bare with area = 1 x2 +8 2700 × 7, 25mm spacing = 9 mn 44088 mm 30.06 mm NINCLES 10 1221 25mm \$ bar C/C @ 50mm - 11 an 18:00 12 ongitudinal Reinforcement 1. N. 1. = 1 Areea = 0.12% bD 124 00 + 2. × 2700 × 400 0.12 100 x 310= 01296mm -3 K) (3 E) 1.68 .101 Provide, 12mm of bares with area = TX12 - 4 ч 1131 + 5 - Spacing A.c.s 2700× 113 = 6 1> AFOIX P. IS 2.96 235 mm 0 - 11 61.31 1X Paris 12mm € bar. @ 250mm C/c 2804 p2.00 m 1.1 2112 AM 2018

2018 MARCH WTFSS 1 8 7 6 5 11 12 13 14 15 INDAY 10 17 18 19 20 21 22 23 24 25 26 27 28 29 WEEK 11 • 077-288 RCC footing for a masonry wall. Design a 300mm thic subjecte Load 0 The SBC GOKN/ 01 including ut. of Soi KN/m 110 GOKNO wall Rent A ... 32 - 0 20 Df 1325 (B) Der eng 12 Wall thickness = 300mm = 0.3mg = GO KA/M oac 12 - 0.480 Fore M20 8 Fe415, Numar 1332 Mi Securet GO KN/m - 0,55m poting, Width 110 KN/m2 Br = 550 mm pressure upward Net Wall Doad * 5 foundat area E Mariak Lite *6 GO KN/M NUMBER DEPART PIOT = 1 0.55 m X1 001011 40 SBC. & Soil 109 N/ mana = 19 asitohaust mm O.K. MORA B = 2018

2018 FEBRU MARCH MTW 5 6 7 MONDAY 12 13 14 15 括 19 20 17 21 ste 22 078-287 · WEEK 12 23 26 27 28 24 Bending Max n Moment oceurcs Sect a distance 6/4 of wall TOP the trom 1.8 e. M P 8 = 9 = 10 09 0.55-0.3) 0.55 8 + 11 1.62 KN-m * 12 * 1 * 2 · 3 Step - III Depth tion 900 mzD oundation 14 0.36-4 uman ck 2 Hume ba - 5 ·62×10 2 550 36 x 20 × 0.48 0.42 × 0.48 1 000 d 587 mm AdopH a Adopt 350mm = 600 mm 1 = 250+50 effective cover = 50 mm 400 Dra 50 = 650 mm £ toundation 2018

2018 WTFSS MARCH 8 7 5 6 12 13 14 15 **UESDAY** 11 10 19 20 21 22 18 17 24 25 26 27 28 12 • 079-286 29 area. Calculation for foundation Steel Step-= 0.87fy A d Ast fy - 0.87 × 415 A × 600 (1 - Ast × 415 ->1.62×10 580×600×2 11 350 50 ASI 7.5 = Ast 34.5×10 4359. 4B 9266 34.5 × 10 A 2 - A +7.5=0 28978mm2 or \$5mm2 Main reinforcement *2 APRIL Bare 22\$, A= IX22 ×â Spacing = 1000 x 7 × 22 28978 +4 19mm & bare @ Bomm % MAY = 15mm ~ 50mm 85 22\$ bare @ 50mm c/c Adopt *6 ongetudinal recinforcement 0.12% bD, Area JUNE 0.12 × 1000 × C50 Som & bare @ 150 mm c/c 780mmbar = 12 \$, A= I(122) 2018

2018 MARCH MTW z 5 Ð 12 13 WEDNESDAY 14 15 16 19 20 21 22 21 2 26 27 28 080-285 · WEEK 12 2 -×12 NU pacin 1000 X 9 C 780 Bel 144 mm Adop @ 144 mm 12 bare 9 - 10 021 -3 - 11 7 137 Pass 0 C D+ 12 = 1 1.42 an-0.92 Citizinan . C +2 PART * 3 11.3 STATIST + 4 5 Min Size 33 10 00 15 ad = 6 1.1 Cris 73 B mail

2018 MARCH SS TF В 13 14 15 11 12 19 20 21 22 18 24 25 26 27 28 29 Design of tubulars steel structures Ch-7 Tubular steel Structures are made to resist Latercal Loads (wind, seismic) in high reise building impact) can be used for office, apartment over 40 storey, LES TROUP CREDICEL CORDERS SSIMO 217 201- V3120 :12 AND DESCRIPTION and sorthing the publicity ar A- = A MARE ROSELLAN 11 Round tabular sections, Permissible stresses 12 Mild steel round bar - Harriston 6mm- 305mm available Dia: Length: 6.1m - 6.4m effectiveness of a member subjected Example: 50mm dia mild steel round +5 bac (15.41kg/m) Same Values tointe yeurs 1.07 11.1 "6 => If length of bar = 14.2m 10 and Mild Steel round bar weight = 4.2 ×15.4 64.722kg

2018 FEBRUARY MARCH MTW -4 10 11 14 15 16 17 18 12 13 19 20 21 22 23 24 25 082-283 · WEEK 12 26 27 28 Tube columns & compression membe 7.2 erinkling » 8 Circular column . Jube. member K10. steel tebular member is subjected to When a " compression, then, the tube may crinkle (i.e the walls of the tube may cave In & folds 12 efter the manner concestina hickney - crinkling of collapse load m2 poisson's ration collapse stress E -1 P= m2 З radius = 2 7.3 Tube tension members & tubular = 3 recot treusses= = 4 - The effectiveness of a member subjected to axial tension depends on c/s area. = 5 So rolled steel section / tubular section some value of tensile revistant. has * 6 Roof trasses are subjected to both axial compressive & tension Torce 6

2018 MARCH S S 24 7 6 5 4 W 11 12 13 14 15 W 17 18 19 20 21 22 W 24 25 26 27 28 29 a SATURDAY WEEK 12 • 083-282 Joints in tubular transes 7.4 т DIDK 13 DYDT 112 KK/DK tubular beams & purclens, Design 4.5 +2 APRIL Ridge pucline 4 priencal patter Puelins - 4 MAY 15 *6 Tie beam JUNE 2018

2018 WTFSS MARCH 10 11 12 13 14 15 MONDAY 17 18 19 20 21 22 13 24 25 26 27 28 29 Timber Strencture Design o Ch-8 as structural which is used The wood material is called timber 15883: 1994 Code - Use Problem -1 A Sal wood (M.P.) Column -2's 150mmx 200mm. Determine the safe axial load on the column, if the unsupported length of the column is (1) 1.5m (ii) 2.8 m (iii) 4m. Assume inside Location standard grade +12 Fore sal wood & inside location j peremissible compressive strept parallel to the grain strem E = 12670MPa (Is-code) Tabled 10-6 MPn (1) Unsupported length of column S= 1.5m = 1500mm Least Lateral I dimension of the column d = 150mm 15 S = 1500 = 10 < 11 Max^m slenderness ratio 150 • 6 => short column 3 conditions Longzalum * gover mediale shortunt 0.584 SKK < 11

2018 FEB MTW MARCH 5 6 12 13 14 15 20 21 22 23 19 TUESDAY 26 27 28 066-279 · WEEK 13 τ. ALCON For short column, €-CP Allowable stress -*8 10.GMPa = = 9 Safe axial load = Area x stress A e 10 (150 x 200) x10.1 Alantin 2.11 1. 1. STORE RATER. 100 × 12 318000N 1 11 = 318 KN 0.74 =2 (ii) Ŧ 20101221 = 3 H 3: 6 MFD 0 11 *4 mill × 5 × 4 34 1.0 action cleaderadec # **6** (a sel-1 1.1 CONTRACT. 5005 Zac'l 14 See. 10.00 G.A 14 Sie 12 Junia 1 The may 127-0 Standal -50.4 2018 Č, 4.15 X 14

2018 MARCH S ŝ 1 8 7 5 6 4 3 10 11 12 13 15 14 WEDNESDAY 17 18 19 20 21 22 23 24 25 26 27 28 WEEK 13 · 087-278 29 Principal matter 2 ISA100+75X8 Purline lie memberc Angles +12 gusset plater omm Pull = 300kr APRIL Welded ameetion. he bean Workshop welding Knee brace 14 = 300KN Working OULO MAY = 450KM = 1.5 × 300 Factoreo Thickness of weld: shouldn't exceed JUNE the rounded weld Size 3 withickness of weld ×8mm = 6mm 2018

2018 MTW MARCH FEB 5 6 12 13 THURSDAY 14 15 19 20 限 21 22 28 088-277 · WEEK 13 26 27 23 . (1) el exceede A top, the thockness should be Q=t-1.5 - 8 2 8-15 G-Smm 2 = 9 Adopt S = 6mm well Eachangle comment = 10 amies OL 4500 20 pm ----= 11 2 01 ba length o the total weld regt cumina = 12 pornal we 0.7 = Rolal + XG 4.2mm = 1 Desi weld dtere -= 2 13 2 me 114 - Aldet h. = 3 17 . O.S. March Sharp 114.963 = 4 SMOK × - 5 NO. 5181 11 () Geth 1.50 512 = 6 L'OLU ٠ JE. 1. STON. Service. Inces ð. 2201 Jack Mar 2018 (11:11-2) BUST &