**THE DESIGN AND ANALYSIS OF A REINFORCED CONCRETE CONTINUOUS BEAM USING THE** **BS CODE**

**BY**

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**SUBMITTED IN PARTIAL FULFILMENT**

**OF THE REQUIREMENT FOR THE AWARD OF THE**

**BACHELOR OF ENGINEEERING (B.ENG) DEGREE IN CIVIL ENGINEERING**

**TO**

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**NIGERIA**

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**SOLUTION**

**Assumptions**

* Dead load,
* Live load,

Design load, DL

| **S/N** | **CALCULATIONS** | **REMARKS** |
| --- | --- | --- |
| **1** | **USING HARDY CROSS METHOD OF MOMENT DISTRIBUTION**  Stiffness, k = (k = for the end spans)  Distribution factor, DF =  Fixed end moment, FEM =  Out of balance moment, OBM = moments at a joint  Balance moment, BM = OBM  Distributed moment, DM = BM DF  Transferred moment, TM = DM  Final moment, M = FEM DM TM |  |
|  | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **MEMBERS** | **AB BA** | **BC CB** | **CD DC** | **DE ED** |  | | **k** | 0.1667 | 0.2381 | 0.1818 | 0.1974 |  | | **DF** 0 | 1 0.4118 | 0.5882 0.567 | 0.433 0.4794 | 0.5206 1 | 0 | | **FEM** | **-72.56 72.56** | **-63.21 63.21** | **-108.4 108.4** | **-51.74 51.74** |  | | **OBM**  -72.56 9.35 -45.19 56.66 51.74 | | | | | | | **BM**  72.56 -9.35 45.19 -56.66 -51.74 | | | | | | | **DM 0** | **72.56 -3.85** | **-5.5 25.62** | **19.57 -27.16** | **-29.5 -51.74** | **0** | | **TM** | **-1.93 36.28** | **12.81 -2.75** | **-13.58 9.79** | **-25.87 -14.75** |  | | **OBM**  -1.93 49.09 -16.33 -16.08 -14.75 | | | | | | | **BM**  1.93 -49.09 16.33 16.08 14.75 | | | | | | | **DM 0** | **1.93 -20.22** | **-28.87 9.26** | **7.07 7.71** | **8.37 14.75** | **0** | | **TM** | **-10.11 0.97** | **4.63 -14.44** | **3.86 3.54** | **7.38 4.19** |  | | **OBM**  -10.11 5.6 -10.58 10.92 4.19 | | | | | | | **BM**  10.11 -5.6 10.58 -10.92 -4.19 | | | | | | | **DM 0** | **10.11 -2.31** | **-3.29 6.00** | **4.58 -5.24** | **-5.68 -4.19** | **0** | | **TM** | **-1.16 5.06** | **3.00 -1.65** | **-2.62 2.29** | **-2.10 -2.84** |  | | **OBM**  -1.16 8.06 -4.27 0.19 -2.84 | | | | | | | **BM**  1.16 -8.06 4.27 -0.19 2.84 | | | | | | | **DM 0** | **1.16 -3.32** | **-4.74 2.42** | **1.85 -0.09** | **-0.10 2.84** | **0** | | **M 0** | **0 85.17** | **-85.17 87.67** | **-87.67 99.24** | **-99.24 0** | **0** | |  |
|  | **Support Moments**            **Free Moments**          **Span Moments**            **Shear Force**                            **DESIGN**  Beam size = 230 \* 600 mm  Beam span = 18 m  Characteristic strength of concrete,  Characteristic strength of steel,  Diameter of bar,  Diameter of stirrup,  Cover = 20 mm  Effective depth,    **Supports**    Ultimate moment of resistance,      Lever arm factor,      Lever arm,  Area of steel in tension,    Provide 3Y16 bars TOP  **Check;**        **Spans**      Lever arm factor,      Lever arm,  Area of steel,    Provide 2Y16 bars BOTTOM  **Deflection**  Design service stress,    Modification factor,      Deflection,      **Shear**  Shear force,  Shear stress,    Permissible shear stress,      The shear condition is (iii), that is,  Hence, minimum stirrups are required throughout the beam span  Spacing,      But spacing is limited to 300 mm  Provide 2 legs Y10 @ 300 mm c/c stirrups throughout    (230 x 600) mm | **Only tension reinforcement is required**  **Use 0.935 as lever arm factor**  **All supports:**  **3Y16 TOP**  **Area of steel provided lies within the limit**  **Use 0.95 as lever arm factor**  **All spans:**  **2Y16 BOTTOM**  **Use 1.68 as modification factor**  **Deflection is satisfied**  **Stirrups:**  **2 legs Y10 @ 300 mm c/c** |
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