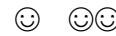


Question No



|                                      |            |            |            |            |            |
|--------------------------------------|------------|------------|------------|------------|------------|
| IC7 = IQ (mA)                        | 0.25       | 0.25       | 0.25       | 0.20       | 0.25       |
| IC8 (mA)                             | 1          | 1          | 1.2        | 1.2        | 1.2        |
| R4 (kΩ)                              | 10         | 10         | 10         | 10         | 10         |
| R3 (kΩ)                              | 0.2        | 0.2        | 0.2        | 0.2        | 0.2        |
| β                                    | 120        | 120        | 120        | 120        | 120        |
| VA7 = VA11 (V)                       | 100        | 120        | 110        | 110        | 120        |
| V+ (V)                               | 10         | 12         | 12         | 8          | 8          |
| V- (V)                               | -10        | -12        | -12        | -8         | -8         |
| VBE = VEB (V)                        | 0.7        | 0.7        | 0.7        | 0.7        | 0.7        |
| VT (V)                               | 0.026      | 0.026      | 0.026      | 0.026      | 0.026      |
| R2 = R3 (kΩ) {IC7 = IQ}              | 0.2        | 0.2        | 0.2        | 0.2        | 0.2        |
| I1=IQ exp[IQ R2/VT] (mA)             | 1.7105     | 1.7105     | 1.7105     | 0.9315     | 1.7105     |
| R1=(V+ - VBE - V-)/I1 (kΩ)           | 11.2833    | 13.6218    | 13.6218    | 16.4254    | 8.9448     |
| IC2 = IC4 = IQ/2 (mA)                | 0.125      | 0.125      | 0.125      | 0.1        | 0.125      |
| Assume VA2 = VA4 = VA7 {not given}   | 100        | 120        | 110        | 110        | 120        |
| Av1 = gm2 (ro2    ro4    Ri)         | 1698.1662  | 1991.2233  | 1846.3886  | 1846.3886  | 1991.2233  |
| gm2 = IC2 / VT (mA/V)                | 4.8077     | 4.8077     | 4.8077     | 3.8462     | 4.8077     |
| ro2 = VA2 / IC2 (kΩ)                 | 800        | 960        | 880        | 1100       | 960        |
| ro4 = VA4 / IC4 (kΩ)                 | 800        | 960        | 880        | 1100       | 960        |
| RoDA = ro2    ro4 (kΩ)               | 400        | 480        | 440        | 550        | 480        |
| RoDA    Ri = (ro2    ro4    Ri) (kΩ) | 353.2186   | 414.1744   | 384.0488   | 480.0610   | 414.1744   |
| Ri = rπ6 + rπ7 (1 + β)               | 3020.16    | 3020.16    | 3020.16    | 3775.2     | 3020.16    |
| rπ6 = [(1+β) β VT] / IQ (kΩ)         | 1510.08    | 1510.08    | 1510.08    | 1887.6     | 1510.08    |
| rπ7 = (β VT) / IQ (kΩ)               | 12.48      | 12.48      | 12.48      | 15.6       | 12.48      |
| Ri = [2 (1+β) β VT] / IQ (kΩ)        | 3020.16    | 3020.16    | 3020.16    | 3775.2     | 3020.16    |
| Av2 = (IQ / 2 VT) RL7                | 2847.2280  | 3112.7553  | 2985.5157  | 2487.0616  | 3112.0430  |
| RL7 = Rc11    Rb8 (kΩ)               | 592.2234   | 647.4531   | 620.9873   | 646.6360   | 647.3050   |
| Rc11 = ro11 [1 + gm11 ( rπ11    R3)] | 1157.0978  | 1388.5174  | 1272.8076  | 1385.4430  | 1388.5174  |
| gm11 = IC7 / VT (mA/V)               | 9.6154     | 9.6154     | 9.6154     | 7.6923     | 9.6154     |
| ro11 = VA11 / IC7 (kΩ)               | 400        | 480        | 440        | 550        | 480        |
| rπ11 = (β VT) / IC7 (kΩ)             | 12.48      | 12.48      | 12.48      | 15.6       | 12.48      |
| rπ11    R3 (kΩ)                      | 0.1968     | 0.1968     | 0.1968     | 0.1975     | 0.1968     |
| Rb8 = rπ8+(1+β)R4 (kΩ)               | 1213.12    | 1213.12    | 1212.6     | 1212.6     | 1212.6     |
| rπ8 = (β VT) / IC8 (kΩ)              | 3.12       | 3.12       | 2.6        | 2.6        | 2.6        |
| Av3                                  | 1          | 1          | 1          | 1          | 1          |
| Av = Av1 x Av2 x Av3                 | 4835066.18 | 6198190.73 | 5512422.21 | 4592082.28 | 6196772.47 |
| Ro = R4    (rπ8 + Z)/(1+β) (kΩ)      | 1.9887     | 2.2921     | 2.1407     | 2.4672     | 2.2895     |
| (rπ8 + Z)/(1+β) (kΩ)                 | 2.4824     | 2.9737     | 2.7237     | 3.2752     | 2.9694     |
| Z = Rc11    Rc7 (kΩ)                 | 297.2447   | 356.6937   | 326.9692   | 393.7050   | 356.6937   |
| Rc7 = ro7 = VA7 / IC7 (kΩ)           | 400        | 480        | 440        | 550        | 480        |