

Total No. of Questions – [4 ]

Total No. of Printed Pages: 4

G.R. No.

Paper Code - P119-123 (T1)

OCTOBER 2019 / INSEM (T1)

F. Y. M. TECH. (CIVIL-WREE) (SEMESTER - I)

COURSE NAME: WATER RESOURCE SYSTEM PLANNING

COURSE CODE: CVPA11183A (ELECTIVE I)

(PATTERN 2018:R1)

Time: [1 Hour]

[Max. Marks: 20]

(\*) Instructions to candidates:

- 1) Answer Q.1 OR Q.2, Q.3 OR Q.4
- 2) Figures to the right indicate full marks.
- 3) Use of scientific calculator is allowed
- 4) Use suitable data where ever required

| Q1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | As per new GR 2019-20/WRE-SEC-079, it is decided to plan a water resource system near to Latur district of Maharashtra before June 2020. Apply “aspects” of WRSP and plan a system accordingly and give every detail of your system w.r.t different aspects only. | [10]       |          |          |            |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
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| OR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                   |            |          |          |            |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| Q2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Analyze annual precipitation data of 5 cities of Maharashtra state from 1901 to 1919 and conclude about the spatial and temporal characteristics of rainfall in these cities.                                                                                     | [10]       |          |          |            |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| <table><tr><th>YEAR</th><th>AKOLA</th><th>GADCHIROLI</th><th>PUNE</th><th>SANGLI</th><th>NANDURBAR</th></tr><tr><td>1901</td><td>933.88</td><td>994.406</td><td>1336.334</td><td>1124.695</td><td>997.655</td></tr><tr><td>1902</td><td>712.29</td><td>776.032</td><td>1262.339</td><td>1118.166</td><td>1761.344</td></tr><tr><td>1903</td><td>937.389</td><td>1357.838</td><td>1526.849</td><td>1402.743</td><td>2020.164</td></tr><tr><td>1904</td><td>699.623</td><td>857.815</td><td>714.334</td><td>828.251</td><td>804.524</td></tr><tr><td>1905</td><td>678.245</td><td>1146.449</td><td>1147.151</td><td>829.149</td><td>1017.318</td></tr><tr><td>1906</td><td>905.271</td><td>1040.583</td><td>1411.103</td><td>1199.796</td><td>1784.281</td></tr><tr><td>1907</td><td>579.667</td><td>906.179</td><td>2005.679</td><td>1361.334</td><td>1396.107</td></tr><tr><td>1908</td><td>806.006</td><td>1103.316</td><td>1126.873</td><td>1239.411</td><td>1219.544</td></tr><tr><td>1909</td><td>820.392</td><td>932.246</td><td>1269.332</td><td>1136.828</td><td>1502.906</td></tr><tr><td>1910</td><td>1029.807</td><td>1305.222</td><td>1852.589</td><td>1413.524</td><td>1782.472</td></tr><tr><td>1911</td><td>557.007</td><td>1144.258</td><td>1114.412</td><td>840.651</td><td>681.559</td></tr><tr><td>1912</td><td>565.422</td><td>1008.152</td><td>1132.438</td><td>1422.951</td><td>1825.829</td></tr><tr><td>1913</td><td>759.978</td><td>1022.125</td><td>1602.764</td><td>1084.536</td><td>1690.276</td></tr><tr><td>1914</td><td>944.245</td><td>1218.192</td><td>1734.952</td><td>1845.105</td><td>1626.911</td></tr><tr><td>1915</td><td>974.933</td><td>1115.564</td><td>1991.677</td><td>1488.888</td><td>989.742</td></tr><tr><td>1916</td><td>1125.835</td><td>1204.553</td><td>1661.495</td><td>1529.617</td><td>2090.479</td></tr><tr><td>1917</td><td>973.541</td><td>1370.337</td><td>1321.124</td><td>1320.033</td><td>1636.297</td></tr><tr><td>1918</td><td>487.806</td><td>844.051</td><td>494.561</td><td>554.948</td><td>612.363</td></tr><tr><td>1919</td><td>871.647</td><td>1210.946</td><td>1331.522</td><td>1061.513</td><td>1719.468</td></tr></table> |                                                                                                                                                                                                                                                                   |            | YEAR     | AKOLA    | GADCHIROLI | PUNE | SANGLI | NANDURBAR | 1901 | 933.88 | 994.406 | 1336.334 | 1124.695 | 997.655 | 1902 | 712.29 | 776.032 | 1262.339 | 1118.166 | 1761.344 | 1903 | 937.389 | 1357.838 | 1526.849 | 1402.743 | 2020.164 | 1904 | 699.623 | 857.815 | 714.334 | 828.251 | 804.524 | 1905 | 678.245 | 1146.449 | 1147.151 | 829.149 | 1017.318 | 1906 | 905.271 | 1040.583 | 1411.103 | 1199.796 | 1784.281 | 1907 | 579.667 | 906.179 | 2005.679 | 1361.334 | 1396.107 | 1908 | 806.006 | 1103.316 | 1126.873 | 1239.411 | 1219.544 | 1909 | 820.392 | 932.246 | 1269.332 | 1136.828 | 1502.906 | 1910 | 1029.807 | 1305.222 | 1852.589 | 1413.524 | 1782.472 | 1911 | 557.007 | 1144.258 | 1114.412 | 840.651 | 681.559 | 1912 | 565.422 | 1008.152 | 1132.438 | 1422.951 | 1825.829 | 1913 | 759.978 | 1022.125 | 1602.764 | 1084.536 | 1690.276 | 1914 | 944.245 | 1218.192 | 1734.952 | 1845.105 | 1626.911 | 1915 | 974.933 | 1115.564 | 1991.677 | 1488.888 | 989.742 | 1916 | 1125.835 | 1204.553 | 1661.495 | 1529.617 | 2090.479 | 1917 | 973.541 | 1370.337 | 1321.124 | 1320.033 | 1636.297 | 1918 | 487.806 | 844.051 | 494.561 | 554.948 | 612.363 | 1919 | 871.647 | 1210.946 | 1331.522 | 1061.513 | 1719.468 |
| YEAR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | AKOLA                                                                                                                                                                                                                                                             | GADCHIROLI | PUNE     | SANGLI   | NANDURBAR  |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| 1901                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 933.88                                                                                                                                                                                                                                                            | 994.406    | 1336.334 | 1124.695 | 997.655    |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| 1902                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 712.29                                                                                                                                                                                                                                                            | 776.032    | 1262.339 | 1118.166 | 1761.344   |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| 1903                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 937.389                                                                                                                                                                                                                                                           | 1357.838   | 1526.849 | 1402.743 | 2020.164   |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| 1904                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 699.623                                                                                                                                                                                                                                                           | 857.815    | 714.334  | 828.251  | 804.524    |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| 1905                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 678.245                                                                                                                                                                                                                                                           | 1146.449   | 1147.151 | 829.149  | 1017.318   |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| 1906                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 905.271                                                                                                                                                                                                                                                           | 1040.583   | 1411.103 | 1199.796 | 1784.281   |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| 1907                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 579.667                                                                                                                                                                                                                                                           | 906.179    | 2005.679 | 1361.334 | 1396.107   |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| 1908                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 806.006                                                                                                                                                                                                                                                           | 1103.316   | 1126.873 | 1239.411 | 1219.544   |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| 1909                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 820.392                                                                                                                                                                                                                                                           | 932.246    | 1269.332 | 1136.828 | 1502.906   |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| 1910                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1029.807                                                                                                                                                                                                                                                          | 1305.222   | 1852.589 | 1413.524 | 1782.472   |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| 1911                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 557.007                                                                                                                                                                                                                                                           | 1144.258   | 1114.412 | 840.651  | 681.559    |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| 1912                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 565.422                                                                                                                                                                                                                                                           | 1008.152   | 1132.438 | 1422.951 | 1825.829   |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| 1913                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 759.978                                                                                                                                                                                                                                                           | 1022.125   | 1602.764 | 1084.536 | 1690.276   |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| 1914                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 944.245                                                                                                                                                                                                                                                           | 1218.192   | 1734.952 | 1845.105 | 1626.911   |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| 1915                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 974.933                                                                                                                                                                                                                                                           | 1115.564   | 1991.677 | 1488.888 | 989.742    |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| 1916                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1125.835                                                                                                                                                                                                                                                          | 1204.553   | 1661.495 | 1529.617 | 2090.479   |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| 1917                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 973.541                                                                                                                                                                                                                                                           | 1370.337   | 1321.124 | 1320.033 | 1636.297   |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| 1918                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 487.806                                                                                                                                                                                                                                                           | 844.051    | 494.561  | 554.948  | 612.363    |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |
| 1919                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 871.647                                                                                                                                                                                                                                                           | 1210.946   | 1331.522 | 1061.513 | 1719.468   |      |        |           |      |        |         |          |          |         |      |        |         |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |         |          |      |         |          |          |          |          |      |         |         |          |          |          |      |         |          |          |          |          |      |         |         |          |          |          |      |          |          |          |          |          |      |         |          |          |         |         |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |          |      |         |          |          |          |         |      |          |          |          |          |          |      |         |          |          |          |          |      |         |         |         |         |         |      |         |          |          |          |          |

Use graphical representation for your reference provided herewith this paper. Refer following table for spatial distances.

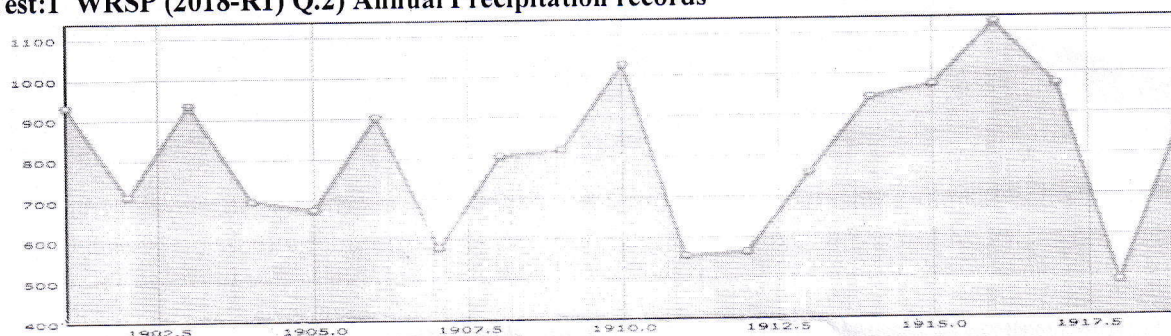
| Reference City | City       | Distance |
|----------------|------------|----------|
| Pune           | Akola      | 482 km   |
| Pune           | Gadchiroli | 850 km   |
| Pune           | Sangli     | 233 km   |
| Pune           | Nandurbar  | 385 km   |

- Q3) Apply any three national water policies to formulate 6 different schemes (2 schemes per type of precipitation) for water conservation in dry, moderate and high precipitation cities in Maharashtra. Give correlation between each policy you have used with each water conservation scheme which you have prepared. [10]

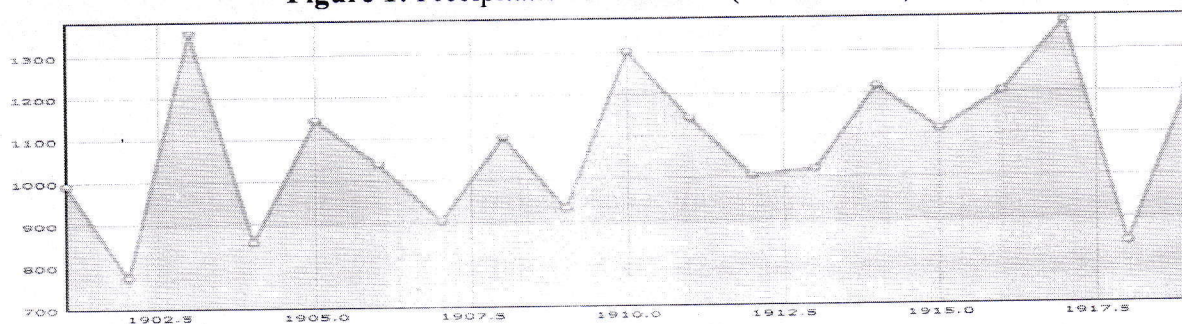
OR

- Q4) Apply knowledge of national water laws and prepare one five years composite action plan for optimized use of water resources in Maharashtra state to satisfy demand and supply relationship as per following constraints. [10]
- 1) 30% of total water should be provided to irrigation sector thought the year except monsoon months.
  - 2) 10 % should be supplied for recreational activities and emergency requirement in domestic sector.
  - 3) 25 % should supplied towards industrial sector (You can vary the % by 5-10%)
  - 4) 15 % Navigation and channel transport. (You can vary the % by 5-10%)
  - 5) 30 % should be towards domestic water supply .

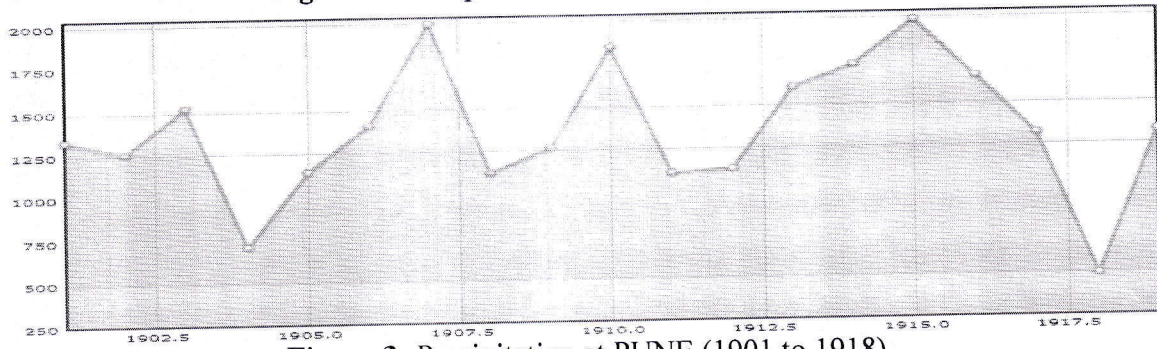
**Test:1 WRSP (2018-R1) Q.2) Annual Precipitation records**



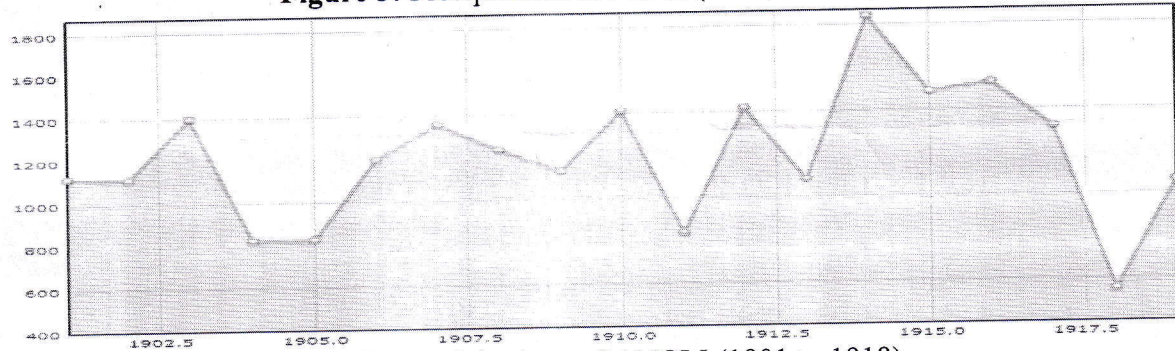
**Figure 1: Precipitation at AKOLA (1901 to 1918)**



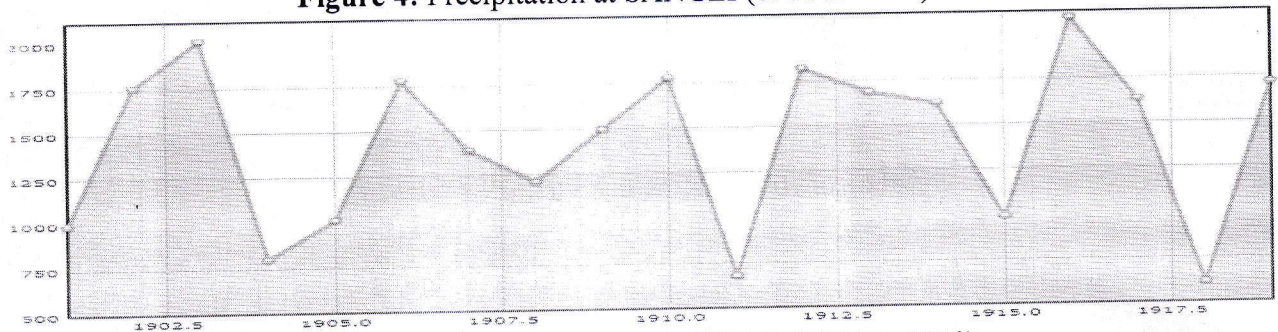
**Figure 2: Precipitation at GADCHIROLI (1901 to 1918)**



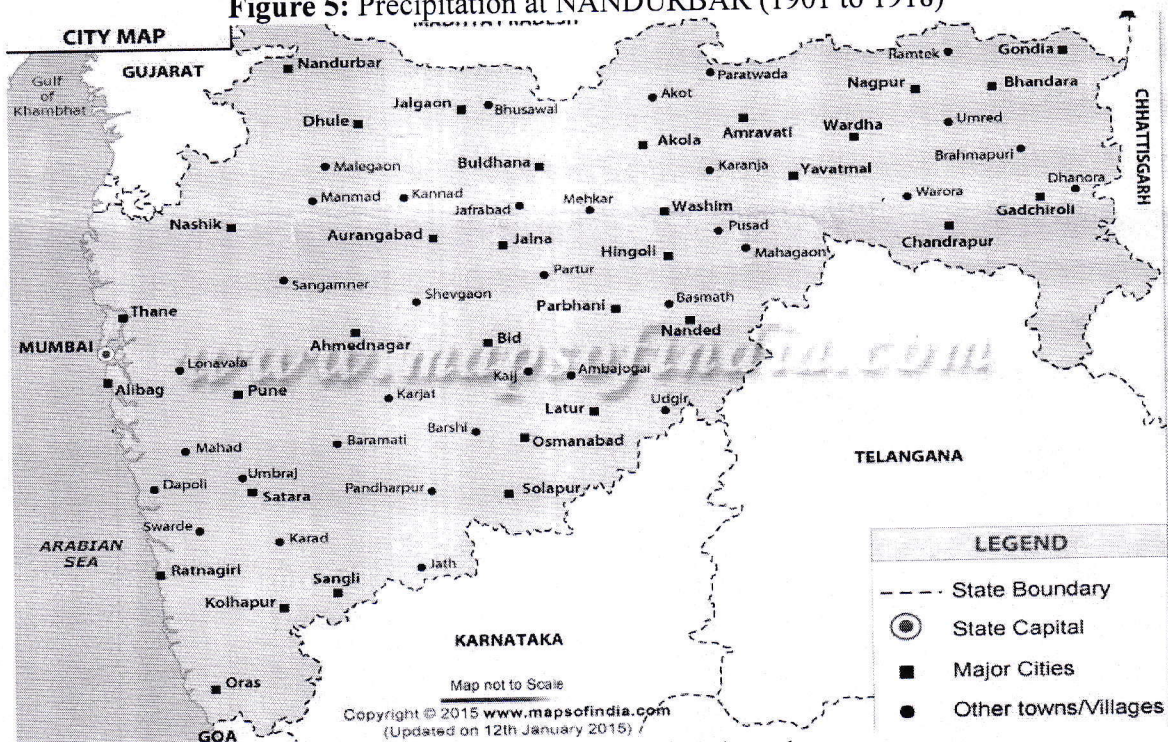
**Figure 3: Precipitation at PUNE (1901 to 1918)**



**Figure 4: Precipitation at SANGLI (1901 to 1918)**



**Figure 5: Precipitation at NANDURBAR (1901 to 1918)**



**Figure 6: Map of Maharashtra**