## **GUJARAT TECHNOLOGICAL UNIVERSITY** PDDC - SEMESTER-VI • EXAMINATION - WINTER • 2014

| Sul<br>Sul  | oject<br>biect    | Code: X6<br>Name: Ele   | )901<br>ectric                  | al Ma                        | achine             | • - III           |                                   |                       |         | Date:    | 29-11- | 2014  |    |
|---|-------------------|---|---------------------------------|------------------------------|--------------------|-------------------|-----------------------------------|-----------------------|---------|----------|--------|-------|----|
| Tir   | ne: 02<br>ructior | 2:30 pm -   | 05:00                           | pm                           |                    |                   |                                   |                       |         | Tota     | l Mark | s: 70 |    |
|   | 1.<br>2.<br>3.    | Attempt all<br>Make suita<br>Figures to t   | question<br>ble assu<br>he righ | ons.<br>Imption<br>It indica | ns whe<br>ate full | rever n<br>marks. | ecessar                           | у.                    |         |          |        |       |    |
| Q.1   | (a)<br>(b)        | Give detail about brake test on dc machine<br>Clarify Zero power factor method to predetermine the voltage regulation of<br>alternator.   |                                 |                              |                    |                   |                                   |                       |         | 07<br>07 |        |       |    |
| Q.2   | <b>(a)</b>        | Describe slip test for determining Xd and Xq of salient pole synchronous 07 machine Draw circuit diagram  |                                 |                              |                    |                   |                                   |                       |         |          |        |       |    |
|   | (b)               | Explain V-  | Jraw c<br>curve                 | of syn                       | chrono             | n.<br>Jus mot     | or                                |                       |         |          |        |       | 07 |
|   | (b)               | Explain con<br>correspond<br>application  | nstruct<br>ling<br>fields       | ional fo<br>for alte         | eatures<br>ernator | s of alte<br>rs   | ernator.                          | Menti                 | ons typ | es and   |        |       | 07 |
| Q.3 (a) A 4 KVA, 3 phase, 110V, 50Hz, star connected alternator has Xd $Xq = 2$ ohm. The machine is delivering full load current of 0.8 p.f k rated voltage. Find the induced emf, load angle and maximum powers. |                   |   |                                 |                              |                    |                   | d = 3 oh<br>f lagging<br>wer outp | m and<br>at<br>out of | 07      |          |        |       |    |
|   | (b)               | State the condition and explain dark lamp method of synchronizing of an <b>07</b> alternator with busbar.   |                                 |                              |                    |                   |                                   |                       |         |          |        |       | 07 |
| Q.3   | (a)<br>(b)        | OR<br>Explain the field's test for d.c. series motor. <b>0</b><br>Explain hunting of synchronous machines and methods of its prevention <b>0</b>  |                                 |                              |                    |                   |                                   |                       |         | 07<br>07 |        |       |    |
| Q.4   | (a)               | <ul> <li>(a) A 220V, 50Hz, 6 pole star connected alternator with ohmic resistance 0.06 ohm per phase, gave following data for open circuit and full load zero power factor characteristics: Find the percentage voltage regulation at full load current of 40A at power factor of 0.8 lag by ZPF method.</li> </ul> |                                 |                              |                    |                   |                                   |                       | 07      |          |        |       |    |
|   |                   | Field<br>current,<br>A  | 0.2                             | 0.4                          | 0.6                | 0.8               | 1.0                               | 1.2                   | 1.4     | 1.8      | 2.2    | 2.6   |    |
|   |                   | Open<br>circuit<br>voltage,<br>Ef in V  | 29                              | 58                           | 87                 | 116               | 146                               | 172                   | 194     | 232      | 261.5  | 284   |    |
|   |                   | Zpf<br>terminal<br>voltage<br>in V  | -                               | -                            | -                  | -                 | -                                 | 0                     | 29      | 88       | 140    | 177   |    |

Explain the construction & operation of auto synchronous motor. **(b)** 

- Explain Hopkinson's test for determination of efficiency of DC shunt machine. Q.4 07 **(a)** 07
  - Explain coil span factor and distribution factor of an alternator. **(b)**

07

OR

| Q.5 | <b>(a)</b> | Explain the effect of varying the excitation and torque of the prime-mover of |    |  |  |  |  |
|-----|------------|---|----|--|--|--|--|
|     |            | synchronous machine connected to infinite bus-bar.                            |    |  |  |  |  |
|     | <b>(b)</b> | Derive emf equation of alternator. Explain distribution factor with effect of | 07 |  |  |  |  |
|     |            | harmonics.  |    |  |  |  |  |

OR

| Q.5 | <b>(a)</b> | Explain the principles of operation of DC servo motor and PM synchronous |  |  |  |  |  |
|-----|------------|--|--|--|--|--|--|
|     |            | motor  |  |  |  |  |  |

(b) Explain construction, working & applications of switched reluctance motor 07

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