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# Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

## III SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

## END SEMESTER EXAMINATIONS, NOV/DEC 2015

## SUBJECT: ELECTRICAL MACHINERY-1 [ELE 205]

**REVISED CREDIT SYSTEM**

Time: 3 Hours 03 December 2015 MAX.MARKS: 50

**Instructions to Candidates**

- Answer **ANY FIVE** questions.
- Use of Non programmable scientific calculators is permitted.

**1A.** A 4 kVA, 200 / 400 V, 50 Hz, single-phase transformer gave the following test results:

No load (OC)(LV side) : 200 V, 0.7 A, 70 W
Short circuit (SC)(HV side) : 15 V, 10 A, 80 W

a) Draw an approximate equivalent circuit of the transformer referred to the low voltage side.
b) Determine the voltage regulation of the transformer when supplying full load at 0.8 pf lag. **(06)**

**1B.** The daily load on the transformer with core loss of 70W is as follows:

8 hours : 1 kVA @ pf 0.6
5 hours : 2 kW@ pf 0.8
5 hours : 3 kW@ pf 0.9
6 hours : No Load

If the full load copper loss is 80W , determine its All Day Efficiency. **(04)**

**2A.** Why are tap changers essential in a power system?. With neat diagram explain the working of an On Load Tap Changer. **(04)**

**2B.** Two single phase transformers A and B are connected in parallel to supply a common load impedance of (12 +j6) Ω. The effective impedance of transformer A and B referred to the load side are (0.12 +j1.3) Ω and (0.17 +j1.6) Ω respectively. The respective no-load secondary e.m.f's are(2400 +j0) V and (2300 +j0) V. Determine :

a) Common terminal voltage.
b) Current delivered by each transformer and their corresponding power factor. **(06)**

**3A.** Two single phase transformers are to be connected in Scott arrangement to supply two phase load from a 3 phase, 11 kV supply. If the main and teaser transformer supplies load of 500 kW @ 0.8 pf lag and 400 kW @ 0.6 pf lead respectively at 500V each, Determine

a) The line currents drawn.
b) Draw the relevant phasor diagrams

**(06)**

**3B.** With neat sketches explain the Inrush current phenomenon in transformers. **(04)**

**4A.** Why are starters necessary for three phase induction motor?. With a neat sketch explain the Star-Delta type of Starter for three phase Induction motor. **(04)**

**4B.** A 3 phase, 400V, 50 Hz, 6 pole star connected induction motor has the following test data:

No load Test : 400V, 9 A, 1250 W (Line Value)

Blocked Rotor test : 200V, 50A, 6930 W (Line Value)

Draw circle diagram and obtain the values of operating power factor, slip and efficiency of the induction motor when drawing a current of 30 A. (use a current scale of 1 cm = 8 A)

**(06)**

**5A.** With neat sketches, explain the process of commutation in DC generators. **(05)**

**5B.** A long shunt DC compound generator delivers a load current of 50 A at 500 V and has armature, series field and shunt field resistances of 0.05 Ω, 0.03 Ω and 250 Ω respectively. The armature consists of 400 lap wound conductors. The net field flux per pole is 30 mWb. Neglecting armature reaction drop and considering a brush drop of 1 V per brush, calculate:

a) Generated e.m.f
b) Speed at which the generator is running.

**(05)**

**6A.** A 250 V DC shunt motor takes a line current of 44 A at rated voltage and runs at a speed of 1000 rpm. The resistances of the armature circuit and field circuit are 0.3 Ω and 125 Ω respectively. Calculate the resistance to be inserted in the armature circuit to obtain same gross power output at 800 rpm. **(05)**

**6B.** Hopkinson's test on 2 identical dc shunt machines has the following test readings: 3 kW power input at 200 V, field currents of 3 A and 2.5 A, generator armature current of 88 A and armature resistance of 0.05 Ω. Determine the efficiency of each machine. **(05)**