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MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent Institution of MAHE, Manipal)

III SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)
MAKE UP EXAMINATIONS, DECEMBER 2017
SUBJECT: ELECTRICAL MACHINERY-I [ELE 2103]

REVISED CREDIT SYSTEM

Time:9.00 AM – 12.00 Noon **Date: 28 December 2017** **Max. Marks: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Use of non-programmable scientific calculator is permitted.
- Graph sheet will be provided.

1A. Draw the complete phasor diagram of a practical single-phase transformer supplying RL load. Assume transformation ratio of unity. ***(03)***

1B. A 100 kVA, 6600/330 V, 50 Hz single phase transformer took 10 A and 436 W at 100 V in a short circuit test referred to HV side. Calculate the voltage to be applied on the HV side on full load at power factor 0.8 lagging when the secondary terminal voltage is 330 V. ***(04)***

1C. An 11,500/2,300 V, 50 Hz, 100 kVA single-phase two-winding transformer is connected as an auto-transformer with additive polarity. Determine the possible voltage ratios and corresponding kVA ratings. ***(03)***

2A. The efficiency of a 500 kVA single-phase transformer is 98.8 % at full-load, 0.8 pf lagging and 96.5 % at half load, unity pf. Calculate (a) Iron loss (b) Full-load copper loss (c) Percentage efficiency at 80 % of full-load, 0.6 pf lagging. ***(05)***

2B. At normal voltage and frequency, an 800 kVA single-phase transformer draws an input power of 7.5 kW on no-load. With reduced voltage applied and full-load current flowing in short-circuited secondary winding, it draws an input power of 14.2 kW. If the transformer operates on the following duty cycle in a day, calculate its all-day efficiency.

Duration (hours)	Load (kW)	Load power factor
6	500	0.8
4	700	0.9
4	300	0.95
10	Nil	

(05)

3A. Explain with connection diagram how transformers can be used for (i) 3 phase to 2 phase (ii) 3 phase to 6 phase conversion. ***(04)***

3B. A 3 phase 50Hz 12 pole 420V delta connected induction motor has the following equivalent circuit parameters: Stator impedance = (2.95+j6.82) Ω per phase; Standstill rotor impedance referred to stator = (2.08+ j 4.11) Ω per phase. Neglect exciting branch admittance. Determine efficiency and useful torque if rotational losses are 750W. ***(06)***

4A. List the starters used for starting three phase induction motors. With the help of a neat sketch explain the working of a star-delta starter. ***(03)***

4B. A 3 phase 220V 50Hz 4 pole induction motor has star connected stator winding. The per phase rotor resistance is 0.1Ω and per phase standstill reactance is 0.9Ω. The ratio of the stator and rotor turns is 1.75. Find the maximum torque and corresponding slip. ***(04)***

4C. What is an Induction Generator? What are their applications? What are their limitations? ***(03)***

5A. With the help of double field revolving theory explain the slip – torque characteristics of single phase induction motor ***(04)***

5B. Explain the functions of following parts of the DC Machines

(i) compensating winding

(ii) Inter-pole winding

(iii) Equalizer connections ***(06)***