MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
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III SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)
END SEMESTER PROCTORED ON-LINE EXAMINATIONS

JANUARY 2022

ELECTRICAL MACHINERY-1 [ELE 2154]

REVISED CREDIT SYSTEM

Time: 75 Minutes + 10 Minutes **Date: 27 January 2022** **Max. Marks: 20**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.
- Time: 75 minutes for writing + 10 minutes for uploading.

1A. A 4 kVA, 200/400 V, 50 Hz, single phase transformer gave a wattmeter reading of 70W during the open-circuit test, and 100W during the short-circuit test at rated current. Calculate,

(i) Efficiency at full load 0.8 pf lagging

(ii) The maximum efficiency of the transformer at upf

(iii) Load condition at which maximum efficiency occurs

Also, comment on the type of load at which maximum and zero voltage regulation occurs. ***(04)***

1B. Three identical single-phase transformers are connected in Delta-Delta. Each transformer is rated at 20 kVA, 2300/230 V and the bank supplies a 40 kVA load at 0.7 power factor lagging. If one defective transformer is removed for repair, calculate for the Open Delta (V-V) connection:

i. The kVA load carried by each transformer
ii. Percentage rated load carried by each transformer
iii. Total kVA rating of the transformer bank in Open Delta (V-V) connection
iv. Ratio of the ratings of open delta (V-V) to Delta-Delta bank
v. Percentage increase in the load on each transformer when one transformer is removed.

Also, Comment on the above results. ***(04)***

1C. Explain the operation of a single-phase induction motor using double field revolving theory. ***(02)***

2A. The following test results were obtained on a 3-phase, 75kW, 3.3kV, 6-Pole, 50Hz, delta-connected three-phase squirrel cage induction motor. Determine the parameters of the approximated equivalent circuit.

No-load Test: 3.3kV, 5A and 2500W

Blocked rotor Test: 400V, 27A, and 15000W

(04)

2B. A three-phase, 400V, 4-pole, 50 Hz, three-phase induction motor provides shaft power of 1.2kW. Considering 2.5% of shaft power as friction and windage losses, determine the rotor copper losses, power supplied to the rotor circuit, gross torque developed by the motor, and efficiency of the rotor when the rotor is running at a speed of 1420rpm.

(03)

2C. A long-shunt compound d. c. generator delivers a load current of 50A at 500 V. The generator has shunt field, series field, and armature resistance of 250 Ω, 0.03Ω, and 0.05 Ω respectively. Calculate the generated emf and the armature current. Assume a brush contact drop of 1V per brush. ***(03)***