

**VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY (VSSUT), ODISHA**  
**Odd Mid Semester Examination for Academic Session 2024-25**

COURSE NAME: B.TECH

SEMESTER: 3<sup>RD</sup>

BRANCH NAME: EE, EEE

SUBJECT NAME: ELECTRICAL MACHINE-I

FULL MARKS: 30

TIME: 90 Minutes

Answer **All** Questions.

The figures in the right hand margin indicate Marks. *Symbols carry usual meaning.*

- Q1. Answer all Questions. [2 × 3]
- a) In a 25 kVA, 2000/200 V power transformer the iron and full load copper losses are 350 W and 400 W, respectively. Calculate the efficiency at unity power factor at (i) full load and (ii) half load. - CO1
  - b) Distinguish between shunt and series field coils construction. - CO2
  - c) Distinguish between self excited and separately excited DC generators. Draw the relevant circuit diagrams of DC generators. - CO3
- Q2. [4+4]
- a) Discuss the working principle of single phase transformer and also explain the constructional details. - CO1
  - b) A 1-phase transformer has 400 primary and 100 secondary winding turns. The net cross-sectional area of the core is 60 cm<sup>2</sup>. If the primary winding is connected to a 50 Hz supply at 520V, then calculate the
    - (i) peak value of flux density in the core
    - (ii) voltage induced in the secondary winding
    - (iii) transformation ratio
    - (iv) EMF induced per turn in both the windings
- OR
- a) A single phase transformer with a ratio of 440V/110V takes a no-load current of 5A at 0.2 power factor lagging. If the secondary supplies a current of 120A at a power factor of 0.8 lagging, estimate the current taken by primary. - CO1
  - b) Open-circuit and short-circuit tests on a 4 kVA, 200/400 V, 50 Hz, one-phase transformer gave the following test:
    - O.C. test: 200 V, 1 A, 100 W (on L.V. side)
    - S.C. test: 15 V, 10 A, 85 W (with primary short-circuited)Calculate the approximate regulation of the transformer at 0.8 power factor leading
- Q3. [4+4]
- a) A 200 kW, 400 V, 4-pole DC generator has 640 lap wound conductors. It is given a brush lead of 2.5 angular mechanical degrees from the geometric neutral. Calculate cross magnetizing and demagnetizing ampere turns per pole. - CO2

- h) A wave wound armature of an eight-pole generator has 51 slots. Each slot contains 16 conductors. The voltage required to be generated is 300 V. What would be the speed of coupled prime mover if flux per pole is 0.05 Wb. If the armature is rewound as lap wound machine and run by same prime mover, what will be the generated voltage.

OR

- a) Distinguish between GNA and MNA. Describe the role of interpoles in a DC generator. - CO2
- b) What do you mean by armature reaction in a DC generator? How are its demagnetizing and cross-magnetizing ampere-turns calculated?

Q4.

[4+4]

- a) Draw and compare the load characteristics of different types of DC generators. - CO3
- b) A four pole lap wound shunt generator supplies 60 lamps of 100W, 240V each; the field and armature resistances are 55ohms and 0.18ohms respectively. If the brush voltage drop is 1V for each brush find,
- (i) Armature current
  - (ii) Current per path
  - (iii) Generated EMF
  - (iv) Power output of DC machine

OR

- a) What are the possible causes for not building up EMF in self excited DC Generators? What are the remedial measures to be taken? - CO3
- b) A load of 20 kW at 230 V is supplied by a compound DC generator. If the series, shunt field and armature resistances are 0.05, 115 and 0.1 ohm respectively. Calculate the generated EMF when the generator is connected as long shunt.

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