Code No: R2021024 **R20** SET - 1

II B. Tech I Semester Regular Examinations, Feb/March - 2022
DC MACHINES AND TRANSFORMERS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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1 a) For a voltage-excited system, show that the electrical force can be expressed as [7M]

$$F_e = -\frac{1}{2}\phi^2 \frac{\partial \Re}{\partial x}$$

Where 'ϕ' is the core flux and '□' is the net reluctance of the magnetic circuit.

b) Explain the operating characteristics of D.C Shunt Generator with relevant equations. [7M]

Or

2 a) Explain the Co-Energy. . For a linear magnetic circuit derive the following relation for the stored magnetic energy W_{fld} and co-energy W'_{fld} [7M]

$W_{fld} = (F\emptyset)/2 = \varphi i/2 = (\varphi^2 Rl)/_2$

b) What is self excitation? What are the conditions for building up of voltage in D.C shunt generator? [7M]

3 a) Why a starter is required to start a DC motor? Explain the working of three point starter with neat sketch. [7M]

b) A 230 V D. C Shunt motor is taking 5 A when running at no load. The armature resistance (including brushes) is 0.2 Ω and field circuit resistance is 115 Ω. For an input current of 72 A, calculate the shaft output and efficiency. Also the armature current at which the efficiency is maximum. [7M]

Or

4 a) With the help of speed-armature current characteristics, explain why the series motors should not be started without any load. [7M]

b) What is armature reaction in DC machines? How it affects the main flux distribution and how can armature reaction be reduced? [7M]

5 a) With suitable diagram, how the Swinburne's test can be employed to predetermine the efficiency at full load condition when running as a generator [7M]

b) Draw the phasor diagram of an ideal transformer on no load. Also, draw a phasor diagram of a practical transformer supplying lagging power factor load. [7M]

Or

6 a) Explain the working of a transformer on no-load and load condition. [7M]

b) During Swinburne's test a 250V DC machine was drawing 3A from the 250V supply. The resistances are 250 Ω and 0.2 Ω. Find the constant loss of the machine. Also find the efficiency of the machine when it is delivering a 20A at 250V. [7M]

7 a) Define all day efficiency. How this efficiency of a transformer varies with load? [7M]

b) The test results of 2.5kVA, 230/115V single-phase transformer are as follows: [7M]
OC Test : 115V, 1.2A, 60W
SC Test: 12V, 10.86A. 120W
Find i) efficiency at 50% full load, 0.8 pf
ii) regulation at 30% full load, 0.8 pf lag and lead

Or

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8 a) What are the necessary and desirable conditions for successful parallel operation of two single phase transformers? [7M]

b) A 600W single phase transformer working at unity power factor has an efficiency of 95 percent at both half full load and full load. Determine the efficiency at 70 percent of full load. [7M]

9 a) With the aid of three phase transformer connections and phasor diagram, explain the vector group Dy11. [7M]

b) Explain the working of Off-Load tap changing transformer with help of neat diagram. [7M]

Or

10 a) In Scott connection prove that the 3-phase currents will be balanced if the 2- phase currents are balanced. Assume unity power factor load. [7M]

b) What is vector grouping? Name the vector groups commonly used in three phase transformers? [7M]