**18EE304**

**Hall Ticket Number:**

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| **II/IV B.Tech (Regular/Supplementary) DEGREE EXAMINATION** | | | |
| **February, 2021** | **Electrical & Electronics Engineering** | | |
| **Third Semester** | **Electrical Machines-I (DC Machines and Transformers)** | | |
| **Time:** Three Hours | | **Maximum:** 50 Marks | |
| *Answer ALL Questions from PART-A.* | | | **(10X1 = 10Marks)** |
| *Answer* ***ANY FOUR*** *questions from PART-B.* | | | **(4X10=40Marks)** |

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|  |  | **PART-A** | CO | BL | M |
| 1 | a) | Define Lenz’s Law. | CO1 | L1 | 1M |
|  | b) | Two Examples for Double Excited Magnetic System. | CO1 | L1 | 1M |
|  | c) | What is the purpose of Commutator in DC Machine? | CO1 | L1 | 1M |
|  | d) | Draw the Open Circuit Characteristics of DC Generator. | CO2 | L2 | 1M |
|  | e) | What is the Principal operation of DC motor? | CO2 | L1 | 1M |
|  | f) | Purpose of Starter in DC Motors while starting time? | CO2 | L1 | 1M |
|  | g) | Draw the Speed torque characteristics of DC shunt motor. | CO3 | L1 | 1M |
|  | h) | Define Transformer. | CO3 | L1 | 1M |
|  | i) | Disadvantages of sumpner’s back to back test. | CO3 | L2 | 1M |
|  | j) | What is KVA rating of auto transformer to that of ordinary transformer. | CO4 | L1 | 1M |
| **PART-B** | | | | | |
| 2 | a) | What are the differences between Electric and Magnetic circuits? | CO1 | L2 | 5M |
|  | b) | A magnetic circuit with a single air gap is shown in fig. Cross-sectional area Ac = 1.8 × 10-3 m2 Mean core length lc = 0.6 m Gap length g = 2.3 x 10-3 m, N = 83 turns. Assume that the core is of infinite permeability and neglect the effects of fringing fields at the air gap and leakage flux. Calculate the reluctance of the core. | CO1 | L3 | 5M |
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| 3 | a) | Derive the Electrical energy input for a single excited magnetic system. | CO1 | L3 | 5M |
|  | b) | Express magnetic field energy stored in single excited magnetic system interms of current. | CO1 | L2 | 5M |
| 4 | a) | How the EMF is developed in a DC generator, Derive the EMF equation of DC Generator. | CO2 | L3 | 5M |
|  | b) | A 6-pole lap wound generator armature has 720 conductors, a flux of 30mWb and a speed of 600rpm. Calculate the emf generated on open circuit. If the same armature is wave wound, at what speed it be driven to generate 600V? | CO2 | L3 | 5M |
| 5 | a) | Explain the load characteristics of DC Shunt Generator. | CO2 | L2 | 5M |
|  | b) | Explain the Parallel Operation of DC generator? What’s the purpose of equalizer bar here? | CO2 | L2 | 5M |
| 6 | a) | Derive the torque equation of DC motor. | CO3 | L2 | 5M |
|  | b) | A 220V DC motor has an armature resistance of 0.75 ohms. It is drawing a armature current of 30A, driving a certain load. Calculate the induced EMF in the motor under this condition. | CO3 | L3 | 5M |
| 7 | a) | Explain the torque armature current, speed to torque and armature current characteristics of DC Compound Motor. | CO3 | L2 | 5M |
|  | b) | A 4 pole, 250V, DC series motor has wave connected armature with 200 Conductors. Flux per pole is 25m Wb, motor draws a current of 60A from supply. With Ra=0.15ohms. Rse=0.2ohms. Calculate the speed under this condition. | CO3 | L3 | 5M |
| 8 | a) | Derive the EMF equation of 1-phase Transformer. | CO4 | L2 | 5M |
|  | b) | A transformer takes a no-load current of 4A, absorbs 250W when primary is connected to a 250V, 50Hz supply. Find the magnetic and iron loss component of no load current. | CO4 | L3 | 5M |
| 9 | a) | Explain principle and operation of Scott-Connection with neat sketch and phasor diagram. | CO4 | L2 | 5M |
|  | b) | A 5kVA, 200 V/ 100 V, 50 Hz, single phase ideal two winding transformer is to use to step up a voltage of 200 V to 300 V by connecting it like an auto transformer. Show the connection diagram to achieve this. Calculate the maximum kVA that can be handled by the autotransformer (without over loading any of the HV and LV coil). How much of this kVA is transferred magnetically and how much is transferred by electrical conduction? | CO4 | L3 | 5M |

