BEE-206

Roll No: 2 0

B. Tech (EE)

Even Semester (3rd)

Minor test examination 2025-2026

Fundamental of Electrical Machines & Transformers

Time: 2 Hrs. **Max Marks: 20**

Note: Answer all questions

Q.1	**Attempt any two parts of the following.**	**Marks**
a)	Describe principle of Electromechanical energy conversion process. Develop energy flow model in EMEC device as a generator and motor.	4
b)	For a singly excited magnetic system, establish relationship of magnetic field stored energy and co-energy.	4
c)	Explain working and constructional parts of DC Machines with suitable diagram and classify dc generators.	4
Q.2	**Attempt any two parts of the following.**	
a)	Explain the concept energy and co-energy with i-γ curve. Derive the expressions for force developed in singly excited system.	3
b)	Derive an expression for the torque in a doubly excited system having salient pole type of rotor configuration. State the assumption made.	3
c)	A Shunt generator gives full load output of 30 kW at a terminal voltage of 220 Volt. The armature and shunt field resistances are 0.05 ohm and 50 ohm respectively. The iron and friction losses are 1000 W. Calculate (i) generated e.m.f (ii) Copper losses (iii) efficiency. 227.038 V 968 W. 96.87	3
Q.3	**Attempt any two parts of the following.**	
a)	Explain the process of commutation in a dc machine and discuss the various methods to improve it	3
b)	Discuss the No-load and Load characteristics of DC generators. Discuss self-excitation process in dc machines.	3
c)	A 250 V, 10 kW, separately excited dc generator has an induced e.m.f of 230 V at full load. If the brush drop is 1Volt per brush, calculate the armature resistance of the generator.	3

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B. TECH 2nd Year

SEMESTER-III, SESSION: 2025-26

MAJOR EXAMINATION

Fundamentals of DC machines & Transformers

Time: 3Hr. Max. Marks: 50

Note- Answer all questions.

Q.1	Attempt any Five parts of the following. (Unit 1 and 2)	Marks
a)	Discuss the difference between singly excited and doubly excited magnetic field systems with some examples.	2
b)	Explain the concept energy and co-energy with i-γ curve. Derive the expressions for force developed in singly excited system.	2
c)	Explain with suitable diagrams the pattern of (i) Lap winding and (ii) wave winding of armature in dc machine.	2
d)	An 8-pole dc generator has an armature with 100 slots and 8 conductors per slot. The winding is so connected to having 8 parallel paths. Determine the speed to generate 230V on no load, if flux per pole is 32mWb.	2
e)	Draw and explain operating characteristics of dc series and compound motors.	2
f)	Define voltage regulation in transformers. Write the conditions for maximum and minimum Voltage regulation.	2
g)	Derive approximate equivalent circuit model of a single-phase transformer with referred parameters.	2
Q.2	**Attempt any Two parts of the following. (Unit3)**	
a)	Explain the process of speed control of dc motor by Ward-Leonard based control system, also discuss constant torque and constant power mode of operation.	5
b)	A 250 Volt dc shunt motor has Ra=0.08 ohm when connected to 250 volt dc supply it develops back emf of 244 volt at 1500 rpm. Determine (i) Armature current (ii) Armature current at starting(iii) Back emf, if armature current is changed to 120 A(iv) The speed of machine if it is operated as a generator in order to deliver an armature current of 87 A at 250 Volt	5
c)	What is Swinburn's test in a dc machine. Draw a diagram and explain the procedure of this test. Derive also the efficiency of dc machine working as motor and generator	5
Q.3	**Attempt any Two parts of the following. (Unit3)**	
a)	Explain with suitable diagrams working of three-point starter to start dc shunt motor. Discuss limitations and differences between three point & four-point starter.	5
b)	A 250 Volt dc series motor takes 40 Amp current when giving its rated output at 1500 rpm. Its resistance is 0.3 ohm. Calculate the value of resistance that must be added to obtain rated torque (i) at starting (ii) at speed of 1000 rpm.	5
c)	Describe various losses in dc machine. Draw power flow diagram for a dc motor and find condition for maximum efficiency and armature current value at maximum efficiency.	5

Q4.	**Attempt any Two parts of the following. (Unit4)**	
a)	Describe working of a single-phase transformer, types of transformer and phasor diagrams under no load and load conditions.	5
b)	Describe the constructional features and working of an autotransformer. Derive an expression for copper saving in conductor materials in an autotransformer over a two winding transformer of equal rating.	5
c)	Derive the condition for maximum efficiency and current at maximum efficiency condition in a transformer. A 250 KVA single phase transformer has iron loss of 1.8 kW. The full load copper loss is 2.2 kW. Calculate the following. (i) Efficiency at full load, 0.8 lagging p.f (ii) KVA supplied at maximum efficiency (iii) Maximum efficiency at 0.8 lagging p.f	5
Q5.	**Attempt any Two parts of the following. (Unit4)**	
a)	Discuss open delta and scott connections in a three-phase transformer. Give its importance and limitations	5
b)	Explain the necessity of tertiary winding in a bank of star-star transformer. A three-phase step down transformer with per phase turns ratio 48:1 connected in delta/star and is supplying a load of 415 kW, 0.8 p.f at 400 volt. Draw the connection diagram and show in it different line voltages.	5
c)	Explain the connection diagrams of star-star, star-delta, delta-star, delta-delta of three-phase transformers, derive relationship between phase and line voltage, current in each case.	5