Code: 19A02304T

R19

B.Tech II Year I Semester (R19) Regular Examinations March 2021

ELECTRICAL TECHNOLOGY

(Electronics & Communication Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Write the expression for e.m.f generated in a DC generator.

(b) An 8-pole wave connected DC generator has 1000 armature conductors and a flux/pole of 0.035 Wb. At what speed must it be driven to generate 600 V.

(c) Explain back e.m.f in a dc motor.

(d) Mention the applications of DC motors.

(e) What are the 2 components of core loss in a 1-phase transformer?

(f) Find the phase voltage of a 3-phase, 440 V, 50 Hz supply system.

(g) What is the relative speed of stator flux with respect to rotor flux in an induction motor?

(h) What is meant by slip of an induction motor?

(i) Define the term synchronous impedance of an alternator.

(j) How are alternators classified?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Explain the principle of operation of a DC generator.

(b) A shunt generator gives full- load output of 30 kW at a terminal voltage of 200 V. The armature and shunt field resistance are 0.05 ohm and 50 ohm respectively. The iron and friction losses are 1000 W. Calculate: (i) Generated e.m.f. (ii) Efficiency.

OR

3 (a) Explain the voltage build up process in DC shunt generators. Explain the various possible causes of this failure if the voltage of a DC shunt generator does not build up.

(b) Draw the external characteristics of various types of DC generators. Discuss the nature of these characteristics and compare them.

UNIT – II

4 (a) Explain the characteristics of: (i) DC shunt motor. (ii) DC series motor. (iii) DC compound motor.

(b) What are the different methods of speed control of DC motor? Give the advantages and disadvantages in brief.

OR

5 (a) Explain the working of a 3-point starter with a neat diagram.

(b) A 440 V DC shunt motor takes a no load current of 2.5A. The resistance of the shunt field and the armature are 550 ohm and 1.2 ohm respectively. The full load line current is 32A. Find the full load output and the efficiency of the motor.

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UNIT – III

6 (a) What useful information is obtained from the open circuit test and short circuit test in a transformer?

(b) If a 3-phase, 100 V, 50 Hz balanced supply system is feeding to a balanced delta connected load of $10\angle 45^0$ ohm. Find the phase and line currents.

OR

7 (a) Draw and explain the no-load phasor diagram for a 1-phase transformer.

(b) Explain the terms: (i) Active power. (ii) Reactive power. (iii) Apparent power.

UNIT – IV

8 (a) Distinguish between squirrel cage and phase wound rotor of an induction motor. Give merits and demerits of each.

(b) A 3-phase, 3300 V, 200HP star connected induction motor has the following parameters per phase $r_1 = r_2' = 0.8\Omega$; $x_1 = x_2' = 3.5\Omega$. Calculate the slip at full load if the frictional and windage loss is 3000 W.

OR

9 Sketch and explain the torque-slip characteristics of a 3-phase induction motor.

UNIT – V

10 (a) What is the working principle of a synchronous motor?

(b) A 1200 KVA, 6600 V, 3-phase star connected alternator with a resistance of 0.4 ohm and reactance of 6 ohm per phase delivers full load current at power factor 0.8 lagging and normal rated voltage. Estimate the terminal voltage for the same excitation and load current at 0.8 p.f leading.

OR

11 (a) What are the advantages and disadvantages of a synchronous motor?

(b) Find the synchronous impedance and reactance in a alternator in which a given field current produces an armature current of 250A on short circuit and a generated e.m.f of 1500 V on open circuit, the armature resistance is 2 ohm. Hence calculate the terminal p.d. when a load of 250A at 6600 V and lagging p.f of 0.8 is switched off.

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Code: 13A02303 **R13**

B.Tech II Year I Semester (R13) Supplementary Examinations August 2021

ELECTRICAL TECHNOLOGY

(Common to ECE & EIE)

(For 2013, 2014 regular & 2015 lateral entry admitted batches only)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) What are the advantages of 3-phase system?
(b) Define phase sequence and explain how to change the phase sequence.
(c) Explain Faraday's laws of electromagnetic induction.
(d) Why series field winding consists of a smaller number of turns.
(e) What is statically induced EMF.
(f) What is the condition for maximum efficiency in a transformer?
(g) Why is the air gap flux maintained constant in the induction motor?
(h) Define slip of induction motor.
(i) Define winding factor.
(j) Draw the open-circuit characteristic of synchronous generator.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Explain the relation between line and phase voltage and currents in balanced systems with neat phasor diagrams.

OR

3 (a) State the advantages of two wattmeter method.
(b) A 415 V, 3-phase a.c motor has a power output of 12.75 kW and operates at a power factor of 0.77 lagging and with an efficiency of 85 per cent. If the motor is delta-connected, determine: (i) The power input. (ii) The line current. (iii) The phase current.

UNIT – II

4 Explain the Swinburne's test to determine no-load losses of a dc machine. What are the limitations of this test?

OR

5 (a) Briefly explain the characteristics of DC shunt motor.
(b) A 220 V DC shunt motor runs at 760 RPM and takes armature current of 48A. Find the resistance to be added to the field circuit to increase the speed at 950 RPM at an armature current of 78A. Assume flux is proportional to field current. Assume $R_a = 0.15\Omega$ and $R_{sh} = 240\Omega$.

UNIT – III

6 (a) Explain the principle of operation of a single phase transformer.
(b) Draw the phasor diagram of transformer with resistive load.

OR

7 A 100 KVA, 50 Hz, 440/11000 V, 1-phase transformer has an efficiency of 98.5% when supplying full- load current at 0.8 p.f and an efficiency of 99% when supplying half full-load current at unity p.f. Find the iron losses and copper losses corresponding to: (i) Full load current. (ii) 70% of full load current.

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UNIT – IV

8 (a) Derive the relationship between full load torque and maximum torque.

(b) The power input to a 500 V, 50 Hz, 6P, 3Φ induction motor running at 975 rpm is 40 kW. The stator losses are 1kW and the friction and windage loss total 2 kW. Calculate: (i) Slip. (ii) Rotor copper loss. (iii) Shaft power. (iv) Efficiency.

OR

9 (a) Explain the torque-slip characteristics of three phase induction motor.

(b) Derive the expression for maximum torque in induction motor.

UNIT – V

10 (a) With relevant diagram, differentiate between the rotors of salient pole and non-salient pole alternators.

(b) A 5 kVA, 220 V, star connected 3-phase salient pole alternator with direct and quadrature axis reactances of 12Ω and 7 Ω, respectively, delivers full load current at unity power factor. Calculate the excitation voltage, neglecting resistance.

OR

11 A 3-phase, star connected, 1000 kVA, 11000 V alternator has rated current of 52.5A. The ac resistance of the winding per phase is 0.45 Ω. The test results are given below:

OC test: field current = 12.5 A, voltage between lines = 422 V

SC Test: field current = 12.5 A, line current = 52.5 A

Determine the full load voltage regulation of the alternator: (i) 0.8 pf lagging. (ii) 0.8 pf leading.

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Code: 15A02306 **R15**

B.Tech II Year I Semester (R15) Supplementary Examinations August 2021

ELECTRICAL TECHNOLOGY

(Common to ECE & EIE)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Distinguish between self-excited and separately excited dc generators.

(b) Explain why the external characteristics of dc shunt generator are more drooping than that of a separately excited generator.

(c) Why starting current is very high in dc motor? How does the starter reduce the starting current to a safe value?

(d) Explain the principle of torque production in a dc motor.

(e) Write the e.m.f equation of 1-phase transformer.

(f) Distinguish between distribution and power transformers.

(g) Compare cage and wound type 3-phase induction motors with reference to construction, performance and applications.

(h) Explain how staring and maximum torques vary with the rotor resistance.

(i) Define the terms synchronous reactance and voltage regulation of an alternator.

(j) Deduce the expression showing relationship between speed, frequency and number poles of a synchronous machine.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Draw a neat sketch of a dc generator and state the functions of each part.

OR

3 (a) Mention the reasons for compounding dc generator. Explain the external characteristics of a dc compound generator with neat sketch.

(b) A shunt generator gives full load output of 30 kW at a terminal voltage of 200 V. The armature and shunt field resistances are 0.05Ω and 50Ω respectively. The iron and friction losses are 1000 W. Calculate generated emf and copper losses.

UNIT – II

4 (a) What are the losses taking place in dc machine and how they vary with load current? Derive the condition for maximum efficiency.

(b) A 120V dc shunt motor having an armature circuit resistance of 0.2Ω and field circuit resistance of 60Ω, draws a line current of 40 A at full load. The brush voltage drop is 3 V and rated full-load speed is 1800 rpm. Calculate: (i) Speed at half load. (ii) Speed at 125% full load.

OR

5 (a) Describe Swinburne's test with the help of neat sketch. List the advantages and disadvantages of the Swinburne's test.

(b) Explain working of 3-point starter with neat sketch.

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UNIT – III

6 Draw and explain the constructional features of a single phase transformer. Also discuss its operation with and without load.

OR

7 (a) Explain Sumperner's test for testing two single phase transformers with neat sketch. Also explain why this is beneficial for finding efficiency of transformers.

(b) A 1-Ø transformer has 550 primary turns and 40 secondary turns. The primary is connected to a 3300 V ac supply. Neglecting losses, calculate: (i) Secondary voltage. (ii) Primary current when the secondary current is 200 A.

UNIT – IV

8 (a) A 25hp, 6-pole, 50 Hz, 3-phase slip ring induction motor runs at 960 revolutions per minute on full load with a rotor current per phase of 35 A. Allowing 250 W for the copper loss in the short circuiting gear and 1000 W for the mechanical losses, find the resistance per phase of the three phase rotor winding.

(b) Explain the principle of operation of a 3-phase induction motor.

OR

9 (a) Develop equivalent circuit for a 3-phase induction motor and explain how the mechanical power developed is taken care in the equivalent circuit.

(b) Draw a typical torque slip characteristics and deduce the condition for maximum torque.

UNIT – V

10 (a) The stator of a 3-phase, 8-pole 750 rpm alternator has 72 slots, each of which contains 10 conductors. Calculate the rms value of the emf per phase if the flux per pole is 0.1 Wb sinusoidally distributed. Assume full-pitch coils and a winding distribution factor of 0.96.

(b) Derive emf equation of an alternator.

OR

11 (a) Explain the principle of operation of a 3-phase synchronous motor.

(b) A 3-phase, 11000 V, star-connected synchronous motor takes a load current of 100 A. The effective reactance and resistance per phase are 30Ω and 0.8Ω respectively. Find the power supplied to the motor and the induced emf for 0.8 power factor lagging.

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