

Code No: R21041

R10

SET - 1

II B.Tech I Semester, Regular Examinations, Nov - 2011

ELECTRICAL TECHNOLOGY
(Com. to ECE, EIE, BME)

Time: 3 hours

Max. Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

1. a) Explain with suitable characteristics, the concept of critical resistance and critical speed in a DC machine?
b) An 8-pole lap wound generator armature has 960 conductors, a flux of 40 mWb and a speed of 400 r.p.m. Calculate the e.m.f generated on open circuit. If the same armature is wave wound, at what speed must it be driven to generate 400 volts? (7M+8M)
2. a) Why is a starter necessary for D.C motor? Explain the working of a 3-point starter with the help of a neat diagram? (7M+8M)
b) A 250 V, D.C shunt motor has an armature resistance of 0.5Ω and a field resistance of 250Ω . When driving a constant torque load at 600 r.p.m the motor draws 21 A. What will be the new speed of the motor if an additional 250Ω resistance is inserted in the field circuit?
3. Discuss the constructional details of single-phase transformer and hence obtain the expression for induced e. m. f. of transformer? (15M)
4. a) Draw the equivalent circuit of a transformer and explain the procedure to obtain the same from open circuit and short circuit tests.
b) A 15 kVA, 1000/400 Volts single phase transformer gave the following test results
Open circuit test: 400 V, 0.8 A, 50 W
Short circuit test: 60V, 10A, 45 W
Calculate the efficiency and voltage regulation at full load 0.85 power factor lag. (7M+8M)
5. a) List the factors governing the performance of induction motors?
b) A 3-phase, 6 pole, 50 Hz induction motor has a slip of 1% at no-load and 3% at full-load
Find the synchronous speed, No load speed, frequency of rotor current at standstill and frequency of rotor current at full load? (7M+8M)

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6. a) Explain the constructional features of alternator.
b) How e.m.f is induced in a 3-phase alternator? Derive the expression for e.m.f induced in an alternator interms of pitch and distribution factors? (7M+8M)
7. Explain the following
a) Shaded pole motor
b) Synchros (8M+7M)
8. a) With the help of neat diagram, explain the working of Moving Iron instrument? Derive the expression for deflecting torque of Moving iron instruments?
b) Write the advantages and disadvantages of PMMC instrument? (9M+6M)

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SET - 2

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Time: 3 hours

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Answer any FIVE Questions
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1. a) Explain the principle of operation of DC machine with neat sketch? (7M+4M+4M)
b) How D.C. Generators are classified?
c) A 6-pole wave connected D.C generator has 52 slots and each slot has 20 conductors. Find the speed of the generator. The generated e.m.f is 240 V and the flux per pole is 5 mWb?
2. a) Explain any one of the speed control techniques of D.C shunt motor?
b) The input to a 250 V, D.C shunt motor is 10 kW. The other particulars of the motor are no load current is 6A, no load speed is 1000 r.p.m, armature resistance is 0.4 Ω and shunt field resistance is 125 Ω . Calculate efficiency and speed of the motor? (6M+9M)
3. a) Draw the phasor diagram of transformer under loaded conditions?
b) Explain the principle of working of 1-Phase transformer on no-load conditions. Also explain the nature of no-load current. (7M+8M)
4. a) What are the different losses occur in a transformer on load?
b) A 50 kVA, 1 Φ transformer has a full load primary current of 250 A and total resistance referred to primary is 0.006 Ω . If the iron loss amounts to 200 W. Find the efficiency on full load and half load at u.p.f? (6M+9M)
5. a) List out the comparisons of a squirrel cage and a slip ring induction motor?
b) A 6 pole, 50 Hz, 3-phase induction motor running on full load with 3% slip develops a torque of 160 Nm at its pulley rim. the friction and windage losses are 210 W and the stator copper and iron losses equal to 1640 W. Calculate overall efficiency at full load? (7M+8M)

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6. a) Explain the pessimistic method of finding voltage regulation of an alternator.
b) A 600V, 60kVA, 1-phase alternator has an effective resistance of 0.2 ohms. A field current of 10 A produces an armature current of 210A on short-circuit and e.m.f. of 480 V on open circuit. Calculate Full-load regulation with 0.8 p.f. lagging? (7M+8M)
7. Explain the following
a) A.C Servo motor
b) Stepper motor (8M+7M)
8. a) Describe the construction and working of a PMMC instrument. Derive the equation for deflection if the instrument is spring controlled?
b) A PMMC instrument has a coil of dimensions 15mm × 12 mm. The flux density in the air gap is 1.8×10^{-3} Wb/m² and the spring constant is 0.14×10^{-6} N-m/deg. Determine the number of turns required to produce an angular deflection of 90 degrees when a current of 5 mA is flowing through the coil? (9M+6M)

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SET - 3

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Answer any FIVE Questions
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1. a) Explain the characteristics of a D.C. series and shunt generator?
b) Why brushes and commutator are necessary for operation of a D.C. Machine? (9M+6M)
2. a) Derive the condition for maximum power developed by motor armature?
b) A 250 V D.C shunt motor has an armature resistance of 0.5Ω and a field resistance of 250Ω . When driving a constant torque load at 600 r.p.m the motor draws 21 A. What will be the new speed of the motor if an additional 250Ω resistance is inserted in the field circuit? (7M+8M)
3. Discuss the constructional details of single-phase transformer and hence obtain the expression for induced e. m. f. of transformer? (15M)
4. a) Draw the equivalent circuit of a transformer and explain the procedure to obtain the same from open circuit and short circuit tests.
b) A 15 kVA, 1000/400 Volts single phase transformer gave the following test results
Open circuit test: 400 V, 0.8 A, 50 W
Short circuit test: 60V, 10A, 45 W
Calculate the efficiency and voltage regulation at full load 0.85 power factor lag. (7M+8M)
5. a) Explain the principle of operation of the poly phase induction motor?
b) A 3-phase, 6 pole, 50 Hz induction motor has a slip of 1% at no-load and 3% at full-load Find the synchronous speed, No load speed, frequency of rotor current at standstill and frequency of rotor current at full load? (7M+8M)

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SET - 3

6. a) Define voltage regulation of an alternator. Explain synchronous impedance method of determining regulation of an alternator?
b) Calculate the voltage induced per phase in a 3-phase, 50 Hz, alternator having a flux per pole of 0.15wb. The numbers of conductors in series are 360. Assume full pitch coil with a distribution factor of 0.96? (7M+8M)
7. a) Explain the principle of operation of A.C tachometer?
b) Write the principle of operation of Capacitor motor? (8M+7M)
8. a) With the help of neat diagram, explain the working of Moving Iron instrument? Derive the expression for deflecting torque of Moving iron instruments?
b) Write the advantages and disadvantages of PMMC instrument? (9M+6M)

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Answer any FIVE Questions
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1. a) Explain the principle of operation of DC machine with neat sketch? (6M+5M+4M)
b) Deduce an expression for the voltage induced in a D.C generator?
c) A 6-pole wave connected D.C generator has 52 slots and each slot has 20 conductors. Find the speed of the generator. The generated e.m.f is 240 V and the flux per pole is 5 mWb?
2. a) Explain various power stages of in a D.C. Motor?
b) What will happen when a D.C. Series Motor is started without a load connected to it?
c) A 240V Series motor takes 40A when giving its rated output at 1500 rpm. Its resistance is 0.3 Ω . Find what resistance must be added to obtain rated torque
i) Starting
ii) At 600 rpm. (4M+4M+7M)
3. a) Draw the phasor diagram of transformer under loaded conditions?
b) Explain the principle of working of 1-Phase transformer on no-load conditions. Also explain the nature of no-load current. (7M+8M)
4. a) What are the different losses occur in a transformer on load?
b) A 50 kVA, 1- Φ transformer has a full load primary current of 250 A and total resistance referred to primary is 0.006 Ω . If the iron loss amounts to 200 W. Find the efficiency on full load and half load at u.p.f? (6M+9M)
5. Explain briefly the different methods of speed control of 3-phase induction motors? (15M)

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SET - 4

6. a) A 6-pole, 3-phase, 50 Hz alternator has 12 slots per pole and four conductors per slot. The winding is five-sixths pitch. The flux per pole is 1.5wb, the armature coils are all connected in series. The winding is star connected. Calculate the induced e.m.f per phase?
- b) A 3-phase, 10kVA, 400V, 50 Hz alternator has per phase armature resistance and synchronous reactance of 0.5ohm and 2.5 ohm respectively. Calculate the generated voltage corresponding to
- Full load unity power factor
 - Full load 0.85 lagging power factor. (7M+8M)
7. Explain the following
- A.C Servo motor
 - Stepper motor (8M+7M)
8. a) Describe the construction and working of a PMMC instrument. Derive the equation for deflection if the instrument is spring controlled?
- b) A PMMC instrument has a coil of dimensions 15mm × 12 mm. The flux density in the air gap is 1.8×10^{-3} Wb/m² and the spring constant is 0.14×10^{-6} Nm/deg. Determine the number of turns required to produce an angular deflection of 90 degrees when a current of 5 mA is flowing through the coil? (9M+6M)