

Code No: R21041

R10**SET - 1**

II B. Tech I Semester, Regular Examinations, Nov – 2012
ELECTRICAL TECHNOLOGY
(Com. to ECE, EIE, BME)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Derive the induced e.m.f equation of a D.C. Generator.  
b) Discuss about various types of D.C generators. (7M+8M)
2. What is the necessity of a starter in a D. C. motor explain with the help of a neat sketch the principle of operation of a 3-point starter. What are the functions of No-Volt and Over-Load release coils? (15M)
3. a) Define an ideal transformer draw and explain the no-load phasor diagram of an ideal single phase transformer  
b) A 40 KVA single phase transformer has 400 turns on the primary and 100 turns on the secondary. The primary is connected to 2000 V, 50 Hz supply. Determine
  - i) The Secondary voltage on open circuit.
  - ii) The current flowing through the two windings on full load.
  - iii) The maximum value of flux (8M+7M)
4. a) Discuss about regulation, losses and efficiency of a transformer.  
b) Explain, how to conduct OC and SC tests on a single phase transformers. (8M+7M)
5. a) What is meant by 'slip' in an induction motor.  
b) Derive the expression for torque developed by a 3-phase induction motor and obtain the expressions for starting torque and maximum torque.  
c) Discuss about torque-slip characteristics of an induction motor. (3M+7M+5M)
6. a) How can you determine the regulation of alternator by synchronous impedance method?  
b) From the following test results, determine the voltage regulation of a 2000 V single phase Alternator delivering a current of 100 A. at 0.8 p.f lag. Test results: Full load current of 100 A is produced on short circuit by a field excitation of 2.5A. An emf of 500V is produced on open circuit by the same excitation the armature resistance is 0.8 ohms. (8M+7M)
7. Write a short note on the following: i) Shaded pole motor ii) Stepper motor (15M)
8. a) Describe the constructional details and working of a attraction type MI instruments. Derive it's torque equation.  
b) If the moving coil of a voltmeter consists of 100 turns wound on a square former which has a length of 30mm. And the flux density in the air gap is  $0.09\text{wb/m}^2$ . Calculate the turning moment on the coil when it is carrying a current of 10mA. (10M+5M)

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1. a) Explain the Load characteristics of DC shunt generator.
b) A 4 pole lap wound D. C. shunt generator has a useful flux per pole of 0.07 wb. The armature winding consists of 220-turns each of 0.004 ohms resistance. Calculate the terminal voltage when running at 900 rpm if the armature current is 50A. (8M+7M)
2. a) How can you conduct Swinburne's test. Write the advantages and disadvantages of the above test.
b) A 250 V D.C shunt motor has armature resistance of 0.25 ohms on load, it takes an armature current of 50A and runs at 750R.P.M. If the flux of motor is reduced by 10 percent without changing the load torque, find the new speed of the motor. (8M+7M)
3. a) Derive the induced e.m.f equation of a transformer
b) Draw the equivalent circuit of a single phase transformer and explain. (8M+7M)
4. Explain the procedure to conduct the following tests on a single phase transformer.
i) Open circuit test and
ii) Short circuit test (15M)
5. Explain about various starting methods of a 3-phase induction motor. (15M)
6. a) Derive the expressions for i) Pitch factor ii) Distribution factor of an alternator.
b) Derive the expression for induced e.m.f of a 3 phase alternator. (7M+8M)
7. Discuss about double revolving field theory in detail. (15M)
8. a) Discuss about principle and operation of permanent magnet moving coil instrument
b) Write the advantages and disadvantages of the above instrument. (7M+8M)

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1. a) Explain the function of commutator in a DC generator  
b) A 4-pole, lap-wound shunt generator has 300 armature conductors and flux per pole of 0.1 Wb. If it runs at 1000 rpm, the armature and field resistance are 0.2  $\Omega$  and 125  $\Omega$  respectively. Calculate the terminal voltage when it is loaded to take a load current of 90A. Ignore armature reaction. (7M+8M)
2. a) Draw and explain the characteristics of a DC series motor  
b) A 230 V, shunt motor has an armature resistance of 0.6  $\Omega$ . If the full load armature current is 30A and no load armature current is 4A. Find the change in back e.m.f from no load to full load. (7M+8M)
3. a) Develop the phasor diagram of a single phase transformer under lagging power factor load conditions  
b) A single phase transformer has 400 primary and 1000 secondary turns. The net cross-sectional area of the core is 60cm<sup>2</sup>. If the primary winding be connected to 50 Hz supply at 520 V, Calculate (i) The peak value of flux density in the core (ii) The voltage induced in the secondary winding. (7M+8M)
4. a) Derive an expression for voltage regulation of a single phase transformer  
b) Explain the short circuit test on single phase transformer with neat sketches. (7M+8M)
5. a) Explain the construction of a three phase squirrel cage induction motor.  
b) A 600 Hp three phase, 440V, 50Hz induction motor with 6 poles has rotor current frequency of 2Hz. Compute the operating slip and actual speed of the machine (9M+6M)
6. a) Explain clearly with necessary circuit diagram, the test to be conducted on a three-phase alternator to determine the synchronous impedance of the synchronous machine.  
b) A 120 kVA, 3000V, single phase alternator has the following armature parameters: Resistance = 0.5 $\Omega$ , synchronous reactance = 10  $\Omega$ . Calculate the percentage voltage regulation at full load at unity power factor. (7M+8M)
7. a) Explain the principle of operation of a stepper motor  
b) Explain about capacitor-start and capacitor-run motors with neat diagrams. (7M+8M)
8. a) Explain the principle of operation of moving coil instruments  
b) Explain various types of controlling torques in an indicating instrument. (8M+7M)

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1. a) Explain the magnetizing characteristics of DC shunt generator?  
 b) The armature of a 4-pole, lap-wound DC shunt generator has 120 slots with 4 conductors per slot. The flux per pole is 0.05wb. The armature resistance is  $0.05\Omega$  and the shunt field resistance is  $50\Omega$ . Then find the speed of the machine when supplying 45A at terminal voltage of 250V. (7M+8M)
  2. a) What is the significance of Back EMF in DC motor?  
 b) A 4-pole, lap connected 230V shunt motor has 410 armature conductors. It takes 41A on full load the flux per pole is 0.05 wb. The armature and field resistances are  $0.1\Omega$  and  $230\Omega$  respectively. Contact drop per brush = 1V. Determine (i) Speed of motor (ii) Total Torque developed in the motor. (7M+8M)
  3. a) Derive the induced EMF equation of a single phase transformer.  
 b) A single phase transformer has 400 primary and 1000 secondary turns. The net cross-sectional area of the core is  $60\text{ cm}^2$ . If the primary winding is connected to a 50 Hz supply at 520V, Calculate (i) Peak value of flux density in the core (ii) Voltage induced in the secondary winding (iii) Transformation ratio (iv) EMF induced per turn in both the windings (7M+8M)
  4. a) Explain about the different losses in a single phase transformer.  
 b) Explain the open circuit test on a single phase transformer with neat sketches. (7M+8M)
  5. a) Explain the slip-torque characteristics of a three phase induction motor.  
 b) Explain the star/Delta starting method of a three phase induction motor. (7M+8M)
  6. a) Derive the expression for distribution factor of an alternator.  
 b) A 120 KVA, 300V, single phase alternator has the following parameters:  
     Armature Resistance           =  $0.5\Omega$   
     Synchronous reactance       =  $10\Omega$   
 Calculate the percentage voltage regulation at full load at 0.8 p.f lagging (7M+8M)
  7. a) What are the applications of a stepper motor and also explain merits and demerits of it.  
 b) Explain the principle of operation of shaded pole motor? (7M+8M)
  8. a) Explain the principle of operation of Moving Iron instruments  
 b) What are the basic requirements of indicating instruments? Briefly discuss them. (7M+8M)