

Code No: R21041

R10**SET - 1****II B. Tech I Semester, Supplementary Examinations, May – 2013****ELECTRICAL TECHNOLOGY**

(Com. to ECE, EIE, BME)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks

- ~~~~~
- Explain how AC voltage generated is converted to D.C. voltage in a generator?
 - What is the main purpose of laminating the armature core of a D.C. Generator?
 - A 4-pole, lap wound, DC shunt generator has a useful flux per pole of 0.07Wb. The armature winding consists of 220 turns each of 0.004Ω resistance. Calculate the terminal voltage when running at 900 rpm, if the armature current is a 50A. (4M+3M+8M)
 - Develop the general expression for the speed of a motor in terms of supply voltage, armature resistance and flux per pole.
 - A DC series motor operates at 800 rpm with a line current of 100 A from 230 V mains. Its armature circuit resistance is 0.15Ω and its field resistance 0.1Ω . Find the speed at which the motor runs at a line current of 25A, assuming that the flux at this current is 45% of the flux at 100A. (7M+8M)
 - Derive the emf equation of a single-phase transformer and draw the no-load phasor diagram.
 - A single phase 2200/250V, 50 Hz transformer has a net core area of 36 cm^2 and a maximum flux density of 6 Wb/m^2 . Calculate number of turns of primary and secondary? (7M+8M)
 - Obtain an expression for the regulation of a single-phase transformer from its equivalent circuit / phasor diagram.
 - A 20 kVA, 2500 / 250 volts, 50 Hz, 1-phase transformer gave the following test results:

O.C. test(L.V. side):	250 V	1.4 A	105 W
S.C. test (H.V. side):	104 V	8 A	320 W

Compute the parameters of the approximate equivalent circuit referred to L.V. (7M+8M)
 - What are the starting methods of 3-phase Induction motor? Explain any one method?
 - Explain the principle of operation of 3-phase Induction motor? (8M+7M)
 - A 3-phase, 10 pole, star connected alternator runs at 700 r.p.m. It has 120 stator slots with 10 conductors per slot, if the flux per pole is 0.056 Wb, determine the phase and line induced e.m.f.
 - Explain how an e.m.f is induced in the armature of alternator. What are the factors that cause a change of the alternator terminal voltage? (8M+7M)
 - Write about the Synchros with neat sketch?
 - Explain the stepper motor characteristics? (8M+7M)
 - Describe the principle of working of a PMMC instrument. Derive the equation for deflection if the instrument is spring controlled.
 - A permanent magnet moving coil instrument has a coil of dimensions $15\text{mm}\times 12\text{mm}$. The flux density in the air gap is $1.8\times 10^{-3}\text{Wb/m}^2$ and the spring constant is $0.14\times 10^{-6}\text{Nm/rad}$. Determine the number of turns required to produce an angular deflection of 90° when a current of 5 mA is flowing through the coil. (8M+7M)

1 of 1

|||||

Code No: R21041

R10**SET - 2****II B. Tech I Semester, Supplementary Examinations, May – 2013****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 the basic principle of operation of a DC. Generator and mention the parts of a DC generator
b) Discuss the reasons for failure of self excitation, and suggest the remedies.
c) A 250V DC shunt machine has line current of 80A. It has armature and field resistances of 0.1Ω and 125Ω respectively. Calculate the power developed in armature when running as a generator (8M+4M+3M)
 2. a) Explain the various methods of speed control of a DC. Shunt Motor.
b) A 220V DC shunt motor having an armature resistance of 0.25Ω carries an armature current of 50 A and runs at 600 r.p.m. If the flux is reduced by 10% by field regulator, find the speed assuming load torque remains the same. (7M+8M)
 3. a) Explain the principle of operation of 1-phase transformer with neat sketch?
b) A 230/460V transformer has primary resistance of 0.2Ω and reactance of 0.5Ω and the corresponding values for the secondary are 0.75Ω and 1.8Ω respectively. Find the secondary terminal voltage when supplying 10A at 0.8 p.f lagging. (7M+8M)
 4. a) Explain, how to find out the efficiency and regulation of a transformer from open circuit and short circuit tests.
b) A 5 kVA, 220 / 110 volts, 1-phase transformer has a maximum efficiency of 96.97% at 0.8 p.f. lagging. It has a core loss of 50 watts and the full load regulation at 0.8 p.f. lagging is 5%. Find the efficiency and regulation at full load 0.9 p.f. lagging. (7M+8M)
 5. a) Explain how to produce the rotating magnetic field in a 3 phase induction motor.
b) The input power to a 6 pole, 3-phase, 50 Hz induction motor is 42 kW, the speed is 970 r.p.m. The stator losses are 1.2 kW and the friction and windage losses 1.8 kW. Find
i) The rotor copper loss and ii) The efficiency of the motor (7M+8M)
 6. a) Derive e.m.f equation for an alternator and explain distribution factor and pitch factor used in e.m.f. Equation.
b) Explain, how to find out the regulation of an alternator by synchronous impedance method. (7M+8M)
 7. Write a short note on the following with neat sketch
a) AC servomotor
b) AC tachometers (8M+7M)
 8. a) State the advantages and disadvantage of PMMC instrument?
b) Explain the basic principle of indicating instrument? (8M+7M)



Code No: R21041

R10**SET - 3****II B. Tech I Semester, Supplementary Examinations, May – 2013****ELECTRICAL TECHNOLOGY**

(Com. to ECE, EIE, BME)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks

~~~~~

1. a) Write the e.m.f equation of a D.C generator and derive it.  
b) A 4-pole machine running at 1000 rpm has an Armature with 80 slots having 8 conductors per slot. The flux per pole is  $6 \times 10^{-2}$  Wb. Determine the induced e.m.f as a D.C generator. If the coils are lap connected. If the current per conductor is 50 amperes, determine the electrical power output of the machine. (7M+8M)
2. a) Describe the power stages of D.C motors?  
b) A 220V shunt motor takes a total current of 80 A and runs at 800 r.p.m. Shunt field resistance and armature resistance are  $50 \Omega$  and  $0.1 \Omega$  respectively. If iron and friction losses amount to 1600 W. Find: i) Copper losses ii) Armature torque  
iii) Shaft torque iv) Efficiency. (7M+8M)
3. a) Briefly explain about core type Transformer and shell-type transformer. What are the main differences between them?  
b) Obtain the Equivalent circuit of a single phase transformer and explain. (7M+8M)
4. a) List out the losses in a single phase transformer?  
b) A 40 kVA transformer has iron loss of 45 W and full load copper loss of 850 W. If the power factor of the load is 0.8 lagging. Calculate i) full load efficiency ii) the load at which maximum efficiency occurs and iii) the maximum efficiency. (5M+10M)
5. a) Sketch torque-slip characteristics of an induction motor working at rated voltage and frequency, deriving necessary expressions.  
b) A 3-phase, 50 Hz, 400 V, wound-rotor induction motor runs at 960 r.p.m. at full-load. The rotor resistance and standstill reactance per phase are  $0.2\Omega$  and  $1\Omega$  respectively. If a resistance of  $1.8\Omega$  is added to each phase of the rotor at standstill, what would be the ratio of starting torque with full voltage and the added resistance to the full-load torque under normal running conditions? (7M+8M)
6. a) Explain clearly about open-circuit and short-circuit tests in Alternator.  
b) Determine the voltage regulation of a 200V per phase alternator at 0.8 p.f lag giving a current of 100A is produced on short circuit by a field excitation of 2.5A. An e.m.f of 500V is produced on open circuit by the same excitation. The armature resistance is  $0.8\Omega$ . (7M+8M)
7. a) What is a stepper motor? Enumerate its advantages and applications.  
b) With neat sketch, explain the working principle of shaded-pole single-phase induction motor. (7M+8M)
8. a) What are the advantages and limitations of a moving iron instrument?  
b) Explain the attraction type and repulsion type moving iron instrument? (7M+8M)



Code No: R21041

**R10****SET - 4****II B. Tech I Semester, Supplementary Examinations, May – 2013****ELECTRICAL TECHNOLOGY**

(Com. to ECE, EIE, BME)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions  
All Questions carry **Equal** Marks

- ~~~~~
- Explain the magnetization characteristics of DC generator?
    - A 6 pole lap wound DC generator has 600 conductors on its armature. The flux per pole is 0.02 Wb. Calculate i) the speed at which the generator must be run to generate 300 V  
ii) What would be the speed if the generator were wave wound? (7M+8M)
  - With Neat diagram explain the construction and working of 3-point starter?
    - A 230 V D.C shunt motor takes 5A at no load and runs at 1000 r.p.m. calculate the speed when loaded and taking a current of 30A. The armature and field resistances are 0.2  $\Omega$  and 230  $\Omega$  respectively. (8M+7M)
  - Draw the equivalent circuit of a transformer and show how the constants of primary and secondary windings may be combined to give a simplified equivalent circuit with the values of constants given in terms of secondary winding?
    - A 100 kVA, 2200/440V transformer has  $R_1=0.3 \Omega$ ,  $X_1=1.1 \Omega$ ,  $R_2=0.01 \Omega$  and  $X_2=0.035 \Omega$ . Calculate i) the equivalent impedance of the transformer referred to the primary and ii) total copper losses. (7M+8M)
  - Derive the condition for maximum efficiency of single phase transformer?
    - The primary and secondary windings of a 40 kVA, 6600/250V, single phase transformer has resistance of 10 $\Omega$  and 0.02 $\Omega$  respectively. The leakage reactance of the transformer referred to the primary side is 35  $\Omega$ . Calculate the percentage voltage regulation of the transformer when supplying full load current at a p.f of 0.8 lagging. (7M+8M)
  - Derive the condition for maximum torque at starting of a 3-phase induction motor.
    - A 100 kW, 3-phase, 420 V, 6-pole, 50 Hz wound rotor induction motor, with its rotor winding short circuited, has a full-load slip of 0.04 and the slip at maximum torque of 0.2 when operating at rated voltage and frequency. Neglect stator resistance and rotational losses. Find i) maximum torque ii) starting torque and iii) full-load rotor ohmic loss (7M+8M)
  - Explain the principle of operation of an Alternator?
    - A 1500 kVA, 6.6 kV, three phase, star connected alternator has a resistance of 0.5  $\Omega$ /phase and a synchronous reactance of 5 $\Omega$ /phase. Find its voltage regulation for i) unity p.f ii) 0.8 lagging p.f iii) 0.8 leading p.f (7M+8M)
  - Explain the operation of a single phase induction motor on the basis of double revolving field theory.
    - Explain the working principle of capacitor type single phase induction motor. (7M+8M)
  - Explain the principle of working of a moving iron ammeter with the help of a neat diagram.
    - The inductance of a moving iron instrument is given by  $L = (10 + 5\theta - \theta^2) \mu\text{H}$  where  $\theta$  is the deflection in radian from zero position. The spring constant is  $12 \times 10^{-6}$  Nm/rad. Estimate the deflection for a current of 5A. (7M+8M)

1 of 1

|||||