

**II B.Tech I Semester, Supplementary Examinations, May - 2012**  
**ELECTRICAL TECHNOLOGY**  
(Com. to ECE, EIE, BME, ECC)

Time: 3 hours

Max Marks: 80

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

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1. a) Explain the principle of operation of a D.C. generator and mention the parts of a D.C generator.  
b) The resistance of the field circuit of shunt wound D.C. generator is 200 ohms when the output of the D.C generator is 100 KW, the terminal voltage is 500 V and the generated e.m.f is 525V. Calculate.
  - i) Armature resistance
  - ii) The value of the generated e.m.f when the output is 60 KW with a terminal voltage 520V.
2. a) Derive an expression for torque developed in a D.C. motor  
b) A 6 pole D.C. motor has were connected armature with 87 slots each slot containing 6 conductors. The flux/pole is 20m wb. And the armature has a resistance of 0.13 ohm. Calculate the speed when the motor is connected to 240V. Supply and taking armature current of 80 A also calculate the torque in Newton meters developed by the armature.
3. a) What is an ideal transformer? Explain the difference between the ideal transformer and real transformer.  
b) A single phase transformer takes 10 Amps on no-load at a power factor of 0.1. The turn's ratio is 4:1 if the load on the secondary is 200 Amp. At a power factor of 0.8 lags. Find the primary current and power factor neglecting the voltage drop in the windings.
4. a) What is the necessity of open circuit Test on a Transformer? What are the parameters find out from this test? Explain with a neat diagram.  
b) The readings obtained from the open circuit and short circuit Tests on a single phase transformer of 50KVA, 110V/220V. Calculate the various parameters.  
O.C. Test  $V_2 = 220V$ ,  $I_0 = 14 A$ ,  $W_0 = 330W$ .  
S.C. Test  $V_{sc} = 21.5V$ ,  $I_1 = 45.45A$ .  $W_{sc} = 490W$ .
5. a) Explain how the rotating magnetic field is produced in a 3 phase Induction motor with neat diagrams.  
b) Explain the term synchronous speed.
6. a) Draw and explain the construction details of an alternator.  
b) Calculate the distribution factor for a single phase alternator having 6 slots/pole when all the slots are wound.
7. a) Explain double reeching field theory of single phase Induction motor.  
b) Write any two applications of a split phase Induction motor.
8. a) How many types the instruments are classified mention them?  
b) Explain the working and construction of an indicating instrument.

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1. a) How do you classify the D.C generator?  
b) A 4 pole lap wound D.C. shunt generator has a useful flux per pole of 0.07wb. The armature winding consists of 220-turns each of 0.004 ohms resistance. Calculate the terminal voltage when running at 900 R.P.M. if the armature current is 50A.
2. Discuss about the operation of 3 point starter for a D.C. Shunt motor with a neat diagram.
3. a) Derive the induced e.m.f equation of a single phase transformer  
b) The maximum flux density in the core of a 250/3000-V 50 Hz single phase transformer is  $1.2 \text{ wb/m}^2$ . If the e.m.f per turn is 8 volts, Determine
  - i) Primary and secondary turns.
  - ii) Area of the core
4. a) Discuss about various losses and efficiency of a transformer.  
b) In a 25 KVA, 2000/200V, single phase transformer the iron and full load copper losses are 350 w and 400w, respectively. Calculate the efficiency at unity power factor on
  - i) Full load
  - ii) half full load.
5. a) Discuss about the principle of operation of a 3 phase induction motor and slip.  
b) A 4 pole 3 phase induction motor operates from a supply whose frequency is 50 Hz. Calculate
  - i) The speed at which the magnetic field of stator is rotating
  - ii) The speed of the rotor when the slip is 0.04
  - iii) The frequency of the rotor currents when the slip is 0.03
  - iv) The frequency of the rotor currents at the stand still.
6. a) Derive the induced e.m.f equation of a 3 phase alternator  
b) A 3- phase 16 pole Alternator has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03 wb. Sinusoid ally distributed and the speed is 375 R.P.M. Find the frequency and phase and line e.m.f. Assume full pitch coil.
7. Write a short note on
  - i) Shaded pole motor
  - ii) Stepper motor.
8. a) Discuss about various torques in measuring instruments.  
b) A moving coil Ammeter can read up to 1 Amp. Has a resistance of 0.02 ohms. How this instrument could be adapted to read
  - i) Voltage up to 300V.
  - ii) Current up to 100 Amperes.

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1. a) Write a note on load characteristics of a D.C shunt generator  
b) A 1500 K.W. 550V, 16 pole D.C. shunt generator runs at 150 R.P.M. What must be the useful flux per pole if there are 2500 lap connected conductors in its armature? The full load copper losses equal to 25 KW. Calculate the area of cross section of the pole shoe if the gap density has a uniform value of  $0.9 \text{ wb/m}^2$ .
2. a) How can you conduct the Swinburne's test on a D.C. machine  
b) A D.C. shunt motor takes 2 A on no-load when connected to 250V D.C. mains with an armature resistance of  $1 \text{ ohm}$ . When the field current is 1 amp, determine the load current corresponding to maximum efficiency.
3. a) Draw and explain the phase diagram of a transformer under no-load and load conditions.  
b) Derive an expression for maximum efficiency of a transformer.
4. a) What is the necessity of short circuit test on a transformer, what are the parameters obtained from this test. Explain with a neat diagram.  
b) A 7.5 KVA 2400V/120V. Transformer was tested by short circuiting the low voltage side and applying 100V to H.V side. The measured power input was 145W. Determine the regulation when the load has 0.8 lag power factor.
5. Explain the various starting methods of a 3-phase induction motor.
6. a) How can you determine the regulation of an Alternator by the synchronous Impedance method?  
b) Calculate the distribution factor for a single phase Alternator having six slots/pole, when only 4 adjacent slots/pole are wound and the remaining being not wound.
7. a) Explain the working of a stepper motor with a neat diagram.  
b) Write a short note on hybrid stepper motor.
8. a) Derive an expression for torque in a PMMC instrument.  
b) Write the advantages and disadvantages of induction type instrument.

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1. a) Derive the induced e.m.f equation of a D.C. Generator.  
b) An 8 pole D.C. Shunt generator with 778 were connected armature conductors and running at 500 R.P.M. Supplies a load of 12.5 ohms resistance and at terminal voltage of 50V. The armature resistance is 0.24 ohms. And the field resistance is 250 ohms. Find the armature current the induced emf and the flux per pole.
2. a) How van you control the speed of a D.C motor
  - i) Flux control method
  - ii) Armature control method.b) A 220V D.C. shunt motor is running at a speed of 800 R.P.M and draws 100A calculate at what speed the motor will run when developing half the torque. Total resistance of the armature and the field is 0.1 ohms. Assume that the magnetic circuit is unsaturated.
3. a) Discuss the constructional features of a transformer in detail.  
b) The core of a 100 KVA, 11000/550V, 50Hys single phase core type transformer has a Goss section of 20cm x 20cm Find:
  - i) The Number of H.V. 4L.V.turns per phase and
  - ii) The emf per turn if the maximum core density is not to exceed 1.3 Tesla. Assume a stacking factor of 0.9 what will happen if the primary voltage is increased by 10% on no-load?
4. How can you conduct open circuit test and short circuit tests on a single phase transformer? Explain with neat circuit diagrams.
5. a) Discuss about torque –slip characteristics of a 3 phase induction motor.  
b) A 3- phase 400/200-V star- star connected wound rotor induction motor has 0.06 ohms rotor resistance and 0.3 ohm stand still reactance per phase. Find the additional resistance required in the rotor circuit to make the starting torque equal to the maximum toque of the motor.
6. a) Discuss about the constructional features of a 3phase alternator.  
b) Find the no-load phase voltage and line voltage of a star connected 3 phase 6 pole alternator which runs at 1200 R.P.M having flux per pole of 0.1 wb sinusoid ally distributed. It's stator has 54 slots having double layer winding. Each coil has sterns and the coil is chorded by 1 slot.
7. Discuss about the operation of
  - i) Split phase induction motor
  - ii) Capacitor start and induction run motor
8. Explain the principle of operation of permanent magnet moving coil instrument with a neat diagram.