Code No: RR220402 **Set No. 1**

II B.Tech II Semester Supplimentary Examinations, Aug/Sep 2007
ELECTRICAL TECHNOLOGY
(Common to Electronics & Communication Engineering, Computer Science & Engineering, Information Technology, Computer Science & Systems Engineering, Electronics & Telematics, Electronics & Computer Engineering and Instrumentation & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Draw and explain typical no-load & load characteristics of a D.C. Series Generator.
   (b) A shunt generator has following magnetizing curve:

If(amps)	0	0.5	1.0	1.5	2.0
E(Volts)	4	42	78	93	100

   Calculate the value of critical field resistance. Also find the value of open-circuit voltage when field resistance is 60 ohms. [8+8]

2. (a) Explain speed control of a D.C Series Motor.
   (b) A 200 V d.c. Series Motor runs at 1000rpm when operating at its full load current of 30 A. The motor resistance is 0.5Ω and the magnetic circuit can be assumed unsaturated what will be the speed if
      i. the load torque is increased by 44%
      ii. the motor current is 20 A. [6+10]

3. (a) Explain the principle of operation of transformer. Derive its e. m. f. equation.
   (b) A 1-phase transformer has 180 turns respectively in its secondary and primary windings. The respective resistances are 0.233Ω and 0.067Ω.
   Calculate the equivalent resistance of
      i. the primary in terms of the secondary winding,
      ii. the secondary in terms of the primary winding, and
      iii. the total resistance of the transformer in terms of the primary. [8+8]

4. (a) What are the transformer tests? Explain.
   (b) Calculate the efficiencies at half-full and 1¼ load of a 100kVA transformer for power factors of
      i. unity;
      ii. 0.8, the copper loss is 1000W at full load = iron loss. [10+6]

5. (a) Explain the rotor resistance starter for an induction motor.

(b) A 3-phase, 6 pole, 400 V, 50 Hz induction motor. takes a power input of 35 kW at its full-load speed of 890 r.p.m. The total stator losses are 1 kW and the friction and windage losses are 1.5 kW.
Calculate

i. slip
ii. rotor ohmic losses
iii. shaft power
iv. shaft torque and
v. efficiency. [6+10]

6. (a) Derive e.m.f equation for an alternator and explain distribution factor and pitch factor used in e.m.f. Equation.

(b) Write the expression showing the relationship between speed frequency and no. of poles of a synchronous machine. The speed of rotation of the turbine driving an alternator is 166.7 r.p.m. What should be the no. of poles of the alternator if it is to generate voltage 50HZ. [10+6]

7. (a) Compare $3-\phi$ induction motor with $3-\phi$ synchronous motor if any four aspects.

(b) The input to an 1100 V, 3 phase star connected synchronous motor is 60 A. The effective resistance and synchronous reactance per phase is 1 ohm and 30 ohm respectively. Find the power supplied to the motor and the induced e.m.f for a power factor of 0.95 leading. [6+10]

8. (a) Single phase induction motors are not self starting. Explain Why?

(b) How is single-phase induction motors made self started? Explain one method. [8+8]

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Code No: RR220402 **Set No. 2**

II B.Tech II Semester Supplimentary Examinations, Aug/Sep 2007
ELECTRICAL TECHNOLOGY
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Explain how a.c. voltage generated is converted to D.C. voltage in a generator?
   (b) What is the main purpose of laminating the armature core of a D.C. Generator.
   (c) A 4-pole, long shunt, lap wound generator supplies 25kw at a terminal voltage of 500 V. The armature resistance is 0.03Ω, series field resistance is 0.04Ω and shunt field resistance is 200Ω. The brush drop may be taken as 1 V. Determine the e m f generated. [5+3+8]

2. (a) State the reasons for drop in speed of a D.C. shunt motor when it is loaded.
   (b) Explain why a D.C. series motor is best suited for electric traction applications.
   (c) Explain why a D.C. shunt motor can be referred as Constant Speed Motor.
   (d) 250 V d.c. shunt motor takes 41 A at full load. Resistances of motor armature and shunt field windings are 0.1Ω and 250Ω respectively. Find the back emf on full load. What will be its generated emf, if working as generator and supplying 41A to load at terminal voltage of 250 V? [3+3+2+8]

3. (a) Explain the principle of operation of transformer. Derive its e. m. f. equation.
   (b) A 1-phase transformer has 180 turns respectively in its secondary and primary windings. The respective resistances are 0.233Ω and 0.067Ω.
   Calculate the equivalent resistance of
      i. the primary in terms of the secondary winding,
      ii. the secondary in terms of the primary winding, and
      iii. the total resistance of the transformer in terms of the primary. [8+8]

4. (a) Write short notes on open circuit and short circuit tests on 1-phase transformers.
   (b) Calculate the effective resistance and leakage reactance of a transformer, in terms of primary the following data on test with the secondary terminals, short-circuited: Applied voltage, 60V; current, 100A; Power input, 1.2kW. [10+6]

5. (a) Explain why the rotor of polyphase induction motor can never attain synchronous speed.

(b) A 10 kW, 400 V, 3-phase, 4-pole, 50 Hz delta connected induction motor is running at no load with a line current of 8 A and an input power of 660 watts. At full load, the line current is 18 A and the input power is 11.20 kW. Stator effective resistance per phase is 1.2Ω and friction, windage loss is 420 watts. For negligible rotor ohmic losses at no load, calculate,

i. stator core loss ;

ii. total rotor losses at full load ;

iii. total rotor ohmic losses at full load ;

iv. full load speed;

v. internal torque, shaft torque and motor, efficiency. [6+10]

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 3phase 50 Hz, alternator having a flux per pole of 0.1515 wb. The no. of conductors in series are 360. Assume full pitch coil with a distribution factor of 0.96. [8+8]

7. (a) Explain the principle of operation of synchronous motors.

(b) A 3-phase alternator is rated at 5 KVA, 110V, 26.3A, 50 Hz and 1200 r.p.m. The stator resistance between terminals as measured with dc is 0.2 ohm. With no load and rated speed the stator line voltage is 160V for a field current of 4A.At rated speed, the short circuit stator current per terminal is 50A for a field current of 4A.compute voltage regulation of alternator at 0.8 p.f. Lagging. Using synchronous impedance method. [8+8]

8. (a) Explain the operation of a single phase induction motor on the basis of double revolving field theory.

(b) Draw a typical torque-speed curve of a single-phase induction motor on the basis of double revolving field theory. [8+8]

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Code No: RR220402 **Set No. 3**

II B.Tech II Semester Supplimentary Examinations, Aug/Sep 2007
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain how a.c. voltage generated is converted to D.C. voltage in a generator?
   (b) What is the main purpose of laminating the armature core of a D.C. Generator.
   (c) A 4-pole, long shunt, lap wound generator supplies 25kw at a terminal voltage of 500 V. The armature resistance is 0.03Ω, series field resistance is 0.04Ω and shunt field resistance is 200Ω. The brush drop may be taken as 1 V. Determine the e m f generated. [5+3+8]

2. (a) Explain speed control of a D.C Series Motor.
   (b) A 200 V d.c. Series Motor runs at 1000rpm when operating at its full load current of 30 A. The motor resistance is 0.5Ω and the magnetic circuit can be assumed unsaturated what will be the speed if
      i. the load torque is increased by 44%
      ii. the motor current is 20 A. [6+10]

3. (a) Draw the phasor diagram of a 1-phase transformer with lagging loads. Explain.
   (b) A 1-Q, 440/220V, 5 KVA, 50Hz transformer, draws a no-load current of 0.8A at a.p.f of 0.25 lag on h.v side. Determine the magnitising component, careless component, emf / turn as either side and the primary current when the secondary current is 18A at a p.f. of 0.9 lag. [6+10]

4. (a) Obtain the equivalent circuit of a single-phase transformer. Explain how to evaluate the equivalent circuit of a transformer from open circuit & short circuit tests. [4+6]
   (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. [6]

5. (a) Sketch torque-speed 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 0.2Ω *and*1Ω respectively. If a resistance of 1.8Ω 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? [8+8]

6. (a) Derive e.m.f equation for an alternator and explain distribution factor and pitch factor used in e.m.f. Equation.

   (b) Write the expression showing the relationship between speed frequency and no. of poles of a synchronous machine. The speed of rotation of the turbine driving an alternator is 166.7 r.p.m. What should be the no. of poles of the alternator if it is to generate voltage 50HZ. [10+6]

7. (a) Explain why a synchronous motor doesn't have self-starting torque. Explain one method of starting a synchronous motor.

   (b) A 3phase, 3300v, star connected synchronous motor has a synchronous reactance of 5ohm per phase. The input to the motor is 1000kw at a normal voltage and the induced line e.m.f is 4000v.Calculate the line current. Neglect armature resistance. [8+8]

8. (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. [8+8]

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Code No: RR220402 **Set No. 4**

II B.Tech II Semester Supplimentary Examinations, Aug/Sep 2007
ELECTRICAL TECHNOLOGY
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain how a.c. voltage generated is converted to D.C. voltage in a generator?
   (b) What is the main purpose of laminating the armature core of a D.C. Generator.
   (c) A 4-pole, long shunt, lap wound generator supplies 25kw at a terminal voltage of 500 V. The armature resistance is 0.03Ω, series field resistance is 0.04Ω and shunt field resistance is 200Ω. The brush drop may be taken as 1 V. Determine the e m f generated. [5+3+8]

2. (a) State the reasons for drop in speed of a D.C. shunt motor when it is loaded.
   (b) Explain why a D.C. series motor is best suited for electric traction applications.
   (c) Explain why a D.C. shunt motor can be referred as Constant Speed Motor.
   (d) 250 V d.c. shunt motor takes 41 A at full load. Resistances of motor armature and shunt field windings are 0.1Ω and 250Ω respectively. Find the back emf on full load. What will be its generated emf, if working as generator and supplying 41A to load at terminal voltage of 250 V? [3+3+2+8]

3. (a) Compare between core type and shell type transformers.
   (b) Derive the emf equation of a 1-Phase transformer and calculate the emf / turn, if the flux is 0.015 wb at a frequency of 50 Hz. [8+8]

4. (a) Obtain the equivalent circuit of a single-phase transformer. Explain how to evaluate the equivalent circuit of a transformer from open circuit & short circuit tests. [4+6]
   (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. [6]

5. (a) Explain the star/delta starter for an induction motor.
   (b) A 400 V, 3-phase, 5 pole, 50 Hz, induction motor draws a power of 2 kW at no load and at rated voltage and frequency. At a full-load slip of 3%. the power input to motor is 50 kW and the stator ohmic loss is 1.5 kW Neglect $I^2 R$ loss at no load. If the stator core loss and mechanical losses are assumed equal, then at a slip of 3% calculate

i. rotor ohmic loss
ii. shaft (or output) power
iii. shaft torque
iv. internal torque and
v. efficiency. [8+8]

6. (a) Derive e.m.f equation for an alternator and explain distribution factor and pitch factor used in e.m.f. Equation.
   (b) Write the expression showing the relationship between speed frequency and no. of poles of a synchronous machine. The speed of rotation of the turbine driving an alternator is 166.7 r.p.m. What should be the no. of poles of the alternator if it is to generate voltage 50HZ. [10+6]

7. (a) Explain the principle of operation of synchronous motors.
   (b) A 3-phase alternator is rated at 5 KVA, 110V, 26.3A, 50 Hz and 1200 r.p.m. The stator resistance between terminals as measured with dc is 0.2 ohm. With no load and rated speed the stator line voltage is 160V for a field current of 4A.At rated speed, the short circuit stator current per terminal is 50A for a field current of 4A.compute voltage regulation of alternator at 0.8 p.f. Lagging. Using synchronous impedance method. [8+8]

8. (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. [8+8]

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