

Code No: 07A30201

R07**Set No. 2**

II B.Tech I Semester Examinations, November 2010

ELECTRICAL MACHINES-I**Electrical And Electronics Engineering****Time: 3 hours****Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Derive the expression for the forces developed in electro magnetic system.
 (b) All energy conversion devices use magnetic field as a coupling medium rather than electrical field. Explain why? [8+8]
2. (a) Explain how voltage will build up in a shunt generator
 (b) Explain the characteristics of D.C. series generator and mark the stable region. [8+8]
3. A 50 KW, 230 V dc shunt motor has an armature resistance of 0.1ohm and a field resistance of 200 ohm. It runs on no-load at a speed of 1400 rpm, drawing a current of 10 A from the mains. When delivering a certain load, the motor draws a current of 200 A from the mains. Find the speed at which it will run at this load and the torque developed. Assume that the armature reaction causes a reduction in the flux/pole of 4% of its no-load value. [16]
4. A 50 Kw, 500V, 4 pole generator has a 2 layer simplex lap winding in 48 slots with 12 conductors in each layer. If the brushes are given an actual lead of 15° , calculate
 (a) Cross magnetizing AT/pole
 (b) Demagnetizing AT/pole and
 (c) Number of turns per pole on the compensating winding if the pole arc to pitch is 0.7 and brushes are placed on geometric neutral plane. [16]
5. Shunt motor connected to a constant d.c. voltage source, drives a load requiring constant electromagnetic torque. Prove that, if counter e.m.f. $E_a > (1/2)V_t$, the speed decreases with an increase in flux (or vice-versa) and if $E_a < (1/2)V_t$ the speed increases with an increase in flux. Here V_t is the armature terminal voltage. [16]
6. A 10 kW, 240V dc shunt motor draws a line current of 5.2A while running at no-load speed of 1200 rpm from a 240V dc supply. It has an armature resistance of 0.25Ω and a field resistance of 160Ω . Estimate the efficiency of the motor when it delivers rated load. [16]
7. The armature core of a 4 pole DC machine has 31 slots each designed to accommodate 4 coil sides of a simplex wave winding. The winding has total of 496 conductors. Find
 (a) Total number of coils

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- (b) Turns per coil
(c) Commutator pitch
(d) Back, front and total pitches and
(e) Number of commutator segments [16]
8. (a) Draw OCC of a dc shunt generator and define critical speed and critical resistance.
(b) A dc shunt generator has the following open circuit magnetization curve at its rated speed
- | | | | | | | |
|-----------------------|-----|-----|-----|-----|-----|-----|
| Field current (A) : | 0.5 | 1.0 | 1.5 | 2 | 3 | 4 |
| EMF (V) : | 180 | 340 | 450 | 500 | 550 | 570 |
- The resistance of the field circuit is $200\ \Omega$. The generator is driven at its rated speed. Find the terminal voltage on open circuit. (Use graph paper) [8+8]

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Answer any FIVE Questions
All Questions carry equal marks

1. (a) Derive the expression for the forces developed in electro magnetic system.
 (b) All energy conversion devices use magnetic field as a coupling medium rather than electrical field. Explain why? [8+8]
2. A 10 kW, 240V dc shunt motor draws a line current of 5.2A while running at no-load speed of 1200 rpm from a 240V dc supply. It has an armature resistance of 0.25Ω and a field resistance of 160Ω . Estimate the efficiency of the motor when it delivers rated load. [16]
3. A 50 KW, 230 V dc shunt motor has an armature resistance of 0.1ohm and a field resistance of 200ohm . It runs on no-load at a speed of 1400 rpm, drawing a current of 10 A from the mains. When delivering a certain load, the motor draws a current of 200 A from the mains. Find the speed at which it will run at this load and the torque developed. Assume that the armature reaction causes a reduction in the flux/pole of 4% of its no-load value. [16]
4. (a) Explain how voltage will build up in a shunt generator
 (b) Explain the charectristics of D.C. series generator and mark the stable region. [8+8]
5. The armature core of a 4 pole DC machine has 31 slots each designed to accomodate 4 coil sides of a simplex wave winding. The winding has total of 496 conductors. Find
 - (a) Total number of coils
 - (b) Turns per coil
 - (c) Commutator pitch
 - (d) Back, front and total pitches and
 - (e) Number of commutator segments [16]
6. A 50 Kw, 500V, 4 pole generator has a 2 layer simplex lap winding in 48 slots with 12 conductors in each layer. If the brushes are given an actual lead of 15° , calculate
 - (a) Cross magnetizing AT/pole
 - (b) Demagnetizing AT/pole and
 - (c) Number of turns per pole on the compensating winding if the pole arc to pitch is 0.7 and brushes are placed on geometric neutral plane. [16]

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7. (a) Draw OCC of a dc shunt generator and define critical speed and critical resistance.
- (b) A dc shunt generator has the following open circuit magnetization curve at its rated speed
- | | | | | | | |
|-----------------------|-----|-----|-----|-----|-----|-----|
| Field current (A) : | 0.5 | 1.0 | 1.5 | 2 | 3 | 4 |
| EMF (V) : | 180 | 340 | 450 | 500 | 550 | 570 |
- The resistance of the field circuit is $200\ \Omega$. The generator is driven at its rated speed. Find the terminal voltage on open circuit. (Use graph paper) [8+8]
8. Shunt motor connected to a constant d.c. voltage source, drives a load requiring constant electromagnetic torque. Prove that, if counter e.m.f. $E_a > (1/2)V_t$, the speed decreases with an increase in flux (or vice-versa) and if $E_a < (1/2)V_t$ the speed increases with an increase in flux. Here V_t is the armature terminal voltage. [16]

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R07**Set No. 1**

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ELECTRICAL MACHINES-I**Electrical And Electronics Engineering****Time: 3 hours****Max Marks: 80****Answer any FIVE Questions****All Questions carry equal marks**

1. (a) Draw OCC of a dc shunt generator and define critical speed and critical resistance.
- (b) A dc shunt generator has the following open circuit magnetization curve at its rated speed

Field current (A) :	0.5	1.0	1.5	2	3	4
EMF (V) :	180	340	450	500	550	570

 The resistance of the field circuit is $200\ \Omega$. The generator is driven at its rated speed. Find the terminal voltage on open circuit. (Use graph paper) [8+8]
2. A 50 Kw, 500V, 4 pole generator has a 2 layer simplex lap winding in 48 slots with 12 conductors in each layer. If the brushes are given an actual lead of 15° , calculate
 - (a) Cross magnetizing AT/pole
 - (b) Demagnetizing AT/pole and
 - (c) Number of turns per pole on the compensating winding if the pole arc to pitch is 0.7 and brushes are placed on geometric neutral plane. [16]
3. (a) Derive the expression for the forces developed in electro magnetic system.
- (b) All energy conversion devices use magnetic field as a coupling medium rather than electrical field. Explain why? [8+8]
4. Shunt motor connected to a constant d.c. voltage source, drives a load requiring constant electromagnetic torque. Prove that, if counter e.m.f. $E_a > (1/2)V_t$, the speed decreases with an increase in flux (or vice-versa) and if $E_a < (1/2)V_t$ the speed increases with an increase in flux. Here V_t is the armature terminal voltage. [16]
5. A 10 kW, 240V dc shunt motor draws a line current of 5.2A while running at no-load speed of 1200 rpm from a 240V dc supply. It has an armature resistance of $0.25\ \Omega$ and a field resistance of $160\ \Omega$. Estimate the efficiency of the motor when it delivers rated load. [16]
6. A 50 KW, 230 V dc shunt motor has an armature resistance of $0.1\ \text{ohm}$ and a field resistance of $200\ \text{ohm}$. It runs on no-load at a speed of 1400 rpm, drawing a current of 10 A from the mains. When delivering a certain load, the motor draws a current of 200 A from the mains. Find the speed at which it will run at this load and the torque developed. Assume that the armature reaction causes a reduction in the flux/pole of 4% of its no-load value. [16]

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7. The armature core of a 4 pole DC machine has 31 slots each designed to accommodate 4 coil sides of a simplex wave winding. The winding has total of 496 conductors. Find
- (a) Total number of coils
 - (b) Turns per coil
 - (c) Commutator pitch
 - (d) Back, front and total pitches and
 - (e) Number of commutator segments [16]
8. (a) Explain how voltage will build up in a shunt generator
- (b) Explain the characteristics of D.C. series generator and mark the stable region. [8+8]

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R07**Set No. 3**

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ELECTRICAL MACHINES-I**Electrical And Electronics Engineering****Time: 3 hours****Max Marks: 80****Answer any FIVE Questions****All Questions carry equal marks**

1. (a) Derive the expression for the forces developed in electro magnetic system.
(b) All energy conversion devices use magnetic field as a coupling medium rather than electrical field. Explain why? [8+8]
2. Shunt motor connected to a constant d.c. voltage source, drives a load requiring constant electromagnetic torque. Prove that, if counter e.m.f. $E_a > (1/2)V_t$, the speed decreases with an increase in flux (or vice-versa) and if $E_a < (1/2)V_t$ the speed increases with an increase in flux. Here V_t is the armature terminal voltage. [16]
3. (a) Draw OCC of a dc shunt generator and define critical speed and critical resistance.
(b) A dc shunt generator has the following open circuit magnetization curve at its rated speed

Field current (A) :	0.5	1.0	1.5	2	3	4
EMF (V) :	180	340	450	500	550	570

The resistance of the field circuit is $200\ \Omega$. The generator is driven at its rated speed. Find the terminal voltage on open circuit. (Use graph paper) [8+8]
4. A 50 KW, 230 V dc shunt motor has an armature resistance of $0.1\ \text{ohm}$ and a field resistance of $200\ \text{ohm}$. It runs on no-load at a speed of 1400 rpm, drawing a current of 10 A from the mains. When delivering a certain load, the motor draws a current of 200 A from the mains. Find the speed at which it will run at this load and the torque developed. Assume that the armature reaction causes a reduction in the flux/pole of 4% of its no-load value. [16]
5. A 10 kW, 240V dc shunt motor draws a line current of 5.2A while running at no-load speed of 1200 rpm from a 240V dc supply. It has an armature resistance of $0.25\ \Omega$ and a field resistance of $160\ \Omega$. Estimate the efficiency of the motor when it delivers rated load. [16]
6. (a) Explain how voltage will build up in a shunt generator
(b) Explain the characteristics of D.C. series generator and mark the stable region. [8+8]
7. A 50 Kw, 500V, 4 pole generator has a 2 layer simplex lap winding in 48 slots with 12 conductors in each layer. If the brushes are given an actual lead of 15° , calculate
(a) Cross magnetizing AT/pole

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- (b) Demagnetizing AT/pole and
- (c) Number of turns per pole on the compensating winding if the pole arc to pitch is 0.7 and brushes are placed on geometric neutral plane. [16]
8. The armature core of a 4 pole DC machine has 31 slots each designed to accommodate 4 coil sides of a simplex wave winding. The winding has total of 496 conductors. Find
- (a) Total number of coils
- (b) Turns per coil
- (c) Commutator pitch
- (d) Back, front and total pitches and
- (e) Number of commutator segments [16]

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