Code No: 09A50206 | R09 | SET-1

B. Tech III Year I Semester Examinations, December-2011
ELECTRICAL MACHINES – III
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

1.a) Discuss the constructional details of synchronous machine.
b) Mention the differences between salient pole and non salient pole synchronous machine. [7+8]

2. Derive the emf equation of alternator, explain the coil span factor, distribution factor and derive the expressions? [15]

3.a) What are the causes of harmonics in the voltage waveform of an alternator?
b) Enumerate various methods used for minimizing harmonics in turbo-alternator.
c) Explain the effect of "armature reaction" in alternators for lagging power factor load, with mmf diagram. [15]

4. A 3-phase, star-connected alternator is rated at 1600 kva, 13500v. The armature effective resistance and synchronous reactance are 1.5Ω and 30Ω respectively per phase. Calculate the percentage regulation for a load of 1280kw at power factors of 0.8 leading 0.8 lagging. [15]

5. Two three-phase alternators operate in parallel. The rating of one machine is 50MW and that of the other is 100MW. Both alternators are fitted with governors having a droop of 4%. How will the machines share a common load of 100MW? [15]

6. Explain V – curves and $\wedge$ - curves of 3-phase synchronous motor. [15]

7. Explain the double field revolving theory of single phase induction motor. [15]

8. Explain the operation of universal motor. [15]

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Code No: 09A50206 | R09 | SET-2

B. Tech III Year I Semester Examinations, December-2011
ELECTRICAL MACHINES – III
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1. Describe with neat sketch, the constructional details of salient pole alternators. [15]
2. A 3-phase, 8-pole, 750 rpm star – connected alternator has 72 slots on the armature. Each slot has 12 conductors and winding is short chorded by 2 slots. Find the induced emf between lines, given the flux per pole is 0.06 wb. [15]
3. What is armature reaction? Explain the effect of armature reaction on the terminal voltage of an alternator at
   i) Unity power factor load
   ii) Zero loading P.F load
   iii) Zero lagging P-F load and draw the corresponding phasor diagrams. [15]
4. A straight – line law connects terminal voltage and load of a 3-phase star – connected alternator delivering current at 0.8 P.f lagging. At no load, the terminal voltage is 3500V and at full load of 2280kw, it is 3300v. Calculate the terminal voltage when delivering current to a 3-phase, star- connected load having a resistance of 8Ω and a reactance of 6Ω per phase. Assume constant speed and field excitation. [15]
5. A synchronous generator operates on constant - voltage constant frequency bus bars. Explain the effect of variation of a) excitation b) steam supply on power output ,power factor, armature current and load angle of the machine. [15]
6. Explain the effect of varying excitation on armature current and power factor in a synchronous motor. Draw V – curves and state their significance. [15]
7. A 3000V, 3-phase synchronous motor running at 1500 y.p.m has its excitation kept constant corresponding to no – load terminal voltage of 3000V. Determine the power input, power factor and torque developed for an armature current of 250A if the synchronous reactance is 5Ω per phase and armature resistance is neglected. [15]
8. Discuss the principle of operation of single phase capacitor start and capacitor run motors. [15]

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Code No: 09A50206 | R09 | SET-3

B. Tech III Year I Semester Examinations, December-2011
ELECTRICAL MACHINES – III
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

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1. What are the different types of ac generators in use? Explain their constructional features and essential differences in their construction. [15]

2.a) Calculate the distribution factor for a 36-slot, 4-pole single layer 3-phase winding.
b) Derive the emf equation of synchronous generator from the fundamental principles. [7+8]

3.a) Explain the effect of load power factor on the armature reaction of alternator.
b) Explain briefly load characteristics of alternator. [8+7]

4. A 3-phase, 1500 kvA, star-connected, 50-Hz, 2300v alternator has a resistance of 0.12Ω. A field current of 70A produces a short – circuit current equal to fuel load current of 376A in each line. The same field current produces an emf of 700V on open circuit. Determine the synchronous reactance of the machine and its full load regulation at 0.8 lagging power factor. [15]

5. What do you mean by synchronization of alternator? Describe any one method of synchronizing? [15]

6. A 3-phase, 11000v, star – connected synchronous motor takes a load current of 100A. The effective reactance and resistance per phase are 30Ω and 0.8Ω respectively. Find power supplied to the motor and induced e.m.f for
a) 0.8 power factor lagging b) 0.8 p.f leading. [15]

7.a) Explain why synchronous motor is not a self starting motor.
b) Briefly explain different starting methods of synchronous motor. [7+8]

8.a) Discuss the double revolving field theory of single phase induction motor.
b) Explain principle of operation of single phase induction motor. [7+8]

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Code No: 09A50206 | R09 | SET-4

B. Tech III Year I Semester Examinations, December-2011
ELECTRICAL MACHINES – III
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

1.a) Explain the constructional details of synchronous machine.
b) Where salient pole rotors are preferred. [7+8]

2.a) What are the advantages and disadvantages of using short – pitched winding and distributed winding in alternator?
b) Derive the expression of coil span factor and distribution factor. [7+8]

3. With relevant diagrams, explain the effect of load power factor on the armature reaction of alternator. [15]

4. A 3 – phase, star – connected, 1000 KVA, 2000v, 50Hz alternator gave the following open circuit and short – circuit test readings:

Field current :	A	10	20	25	30	40	45
O.C voltage :	V	800	1500	1760	2000	2350	2600
S.C armature current:	A		200	250	300		

Armature resistance per phase is 0.2Ω
Draw the characteristics and determine the full load percentage regulation at
a) 0.8 P.F. lead b) 0.8 p.f lag. [15]

5. Draw and explain the phasor diagram of salient pole alternator supplying full load lagging power current. Show that the power output per phase is given by

$$P = \frac{E_v}{X_d}\sin\delta + \frac{V^2}{2}\left[\frac{1}{x_9} - \frac{1}{x_d}\right]\sin 2\delta\,.$$ [15]

6. Two station generators A and B operate in parallel station capacity of A is 50Mw and that of B is 25 Mw. Full load speed regulation of station A is 3% and full load speed regulation of B is 3.5%. Calculate the load sharing if the connected load is 50MW, No – load frequency is 50Hz. [15]

7. Describe briefly the effect of varying excitation upon armature current and power factor of a synchronous motor when input power to the motor is maintained constant. [15]

8. Explain the principle and constructional features of stepper motor. [15]

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