

Code No: 07A50203

R07**Set No. 2****III B.Tech I Semester Examinations, November 2010****ELECTRICAL MACHINES-III****Electrical And Electronics Engineering****Time: 3 hours****Max Marks: 80****Answer any FIVE Questions****All Questions carry equal marks**

1. Explain the principle of operation of permanent magnet motor. [16]
2. (a) Derive an expression for the reactive power output from the terminals of a cylindrical rotor alternator.
(b) A 3 phase, 20MVA, 11KV, star connected alternator has $Z_s = 1 + j8 \Omega$ per phase. Determine the max. reactive power that can be delivered by this alternator for an excitation voltage of 14KV. [8+8]
3. (a) Why is a rotating field system used in preference to a stationary field? A 6-pole alternator rotates at 1000 rpm. What is the frequency of the generated voltage?
(b) List difference between salient type and non salient type of rotor construction. [8+8]
4. Prove that a single phase induction motor winding when excited by a single phase supply Produces two equal and opposite revolving fields. [16]
5. (a) Derive necessary equations for power developed in a synchronous motor.
(b) A 2300 volts three phase star connected synchronous motor has synchronous impedance of $(0.2 + j 2.2)$ ohms per phase. The motor is operating at 0.7 power factor leading with line current of 200 amperes. Determine back emf per phase. [8+8]
6. A 1000KVA, 6.6KV, 3 phase star connected synchronous generator has a synchronous reactance of 25Ω per phase with negligible resistance. It supplies full load current at 0.8 p.f. lagging and at rated terminal voltage. Compute the terminal voltage for the same excitation when the generator supplies full load current at 0.8 p.f. leading. [16]
7. Draw the excitation circle for a synchronous motor. How is it derived? [16]
8. (a) Compare the results obtained for voltage regulation by emf, mmf, zpf, ASA and saturated synchronous method.
(b) A 3 phase 17.32KVA, 400V, star connected alternator is delivering rated load at 400V and at p.f. 0.8 lag. Its synchronous impedance is $0.2 + j2 \Omega$ per phase. Find the load angle at which it is operating. [8+8]

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R07**Set No. 4****III B.Tech I Semester Examinations, November 2010****ELECTRICAL MACHINES-III****Electrical And Electronics Engineering****Time: 3 hours****Max Marks: 80**

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1. A star connected 3 phase, 4 pole, 50 Hz alternator has a single layer winding in 24 stator slots. There are 50 turns in each coil and the flux per pole is 0.05 Wb. Find the open circuit voltage? [16]
2. Discuss with circuit diagram any one of method of starting. [16]
3. Explain the principle of operation of a universal motor along with neat Diagram. [16]
4. Assume two axis model and draw the phasor diagram of a synchronous motor drawing leading current. [16]
5. Sketch and explain the torque slip characteristic of a single phase induction motor based on two field revolving field theory. [16]
6. Describe a method of synchronizing 3 phase synchronous machine to the infinite bus bars using two bright one dark lamp method with relevant circuit diagram. [16]
7. Sketch and explain the O.C. and S.C. characteristics of a synchronous machine. How voltage regulation can be calculated by the use of their results? [16]
8. What is armature reaction? Explain the effect of armature reaction on the terminal voltage of an alternator at
 - (a) u.p.f. load
 - (b) zero leading power factor load. Draw the relevant phasor diagrams. [16]

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R07**Set No. 1**

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1. Explain the operation of a single phase induction motor using split phase technique. [16]
2. A 1200 KVA, 6600V, 3 phase star connected alternator has its armature resistance as 0.25Ω per phase and its synchronous reactance as 5Ω per phase. Calculate its regulation if it delivers a full load at 0.8 lagging and 0.8 leading p.f. [16]
3. Explain the principle of operation of a A.C. series motor with neat sketch. [16]
4. Show the locus of stator current for a constant output of 3phase a synchronous motor connected to a constant voltage, constant frequency bus- bars is circle. [16]
5. A 11KV, 3 phase, star connected synchronous generator delivers 4000 KVA at unity power factor when running on constant voltage constant frequency bus bars. If the excitation raised by 20%, determine the KVA and power factor at which the machine now works. The steam supply is constant and the synchronous reactance is 30ω per phase. Neglect the power losses and assume the magnetic circuit to be un saturated? [16]
6. Explain the construction and principle of operation of synchronous motor. [16]
7. A 3 phase, 10 pole star connected alternator runs at 600 rpm. It has 120 slots with 8 conductors per slot and conductors of each phase are connected in series. Determine the phase and line electromotive forces if the flux per pole is 56 mWb. What harmonics due to slots might occur in the phase and line voltages. [16]
8. The O.C.C. of a 10 MVA, 6.6KV, 3 phase star connected alternator is given by the following data:

Exciting Current (A)	0	35.5	60	80	100	118	142
Line Voltage(KV)	0	3	4.8	6.0	6.8	7.2	7.8

And the full load z.p.f. characteristic is given by:

Exciting Current(A)	40	92	128	156	170
Line Voltage(KV)	0	3	4.8	6.0	6.6

Assuming the leakage reactance to be 15% and ignoring resistance, determine the excitation required for full load, normal voltage at a p.f. of 0.8 lagging. [16]

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R07**Set No. 3****III B.Tech I Semester Examinations, November 2010****ELECTRICAL MACHINES-III****Electrical And Electronics Engineering****Time: 3 hours****Max Marks: 80****Answer any FIVE Questions****All Questions carry equal marks**

1. Explain different methods of starting of a synchronous motor. [16]
2. Draw the connection diagram of a capacitor start capacitor run single phase induction motor and explain its principle of operation. [16]
3. Explain the following:
 - (a) Though the distributed windings gives reduced emfs as compared to concentrated winding, yet it is most commonly employed. Why?
 - (b) What is meant by winding factor?
 - (c) What is meant by pitch factor and distribution factor? [16]
4. A straight line 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. [16]
5. Explain the principle of operation of a universal motor along with neat Diagram. [16]
6. (a) Draw the phasor diagram of synchronous motor. Explain the effect of change in excitation if load is constant.
 (b) A 60Kw, 400V, three phase synchronous motor is operating at full load with an efficiency of 92% if the field current is adjusted to make its power factor 0.8 leading estimate the armature current. [8+8]
7. (a) What do you understand by the term space phase angle?
 (b) In a cylindrical rotor alternator armature current is in phase with the excitation voltage. Develop the space and time phasor diagrams for this alternator. Draw these two diagrams in one phasor diagram and show that armature reaction mmf at unity p.f. is cross magnetizing in nature. [16]
8. Two exactly similar 3000 KVA synchronous generators operate in parallel. The governor of the first machine is such that the frequency drops uniformly from 50 Hz on load to 48 Hz on full load. The corresponding uniform speed drop of second machine is from 50 Hz to 47.5 Hz.
 (a) How will the two machines share a load of 5000 KW?

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(b) What is the max. load at u.p.f. that can be delivered without overloading either machine? [16]

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