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Total number of printed pages – 2

B. Tech  
BENG 1201

## Special Examination – 2012

### ELECTRICAL MACHINES

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any **five** from the rest.

The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2 × 10
  - (a) What is the difference between long shunt and short shunt compound compound motor ?
  - (b) What is 'Pole pitch' and 'commutator pitch' in case of a DC machine ?
  - (c) Define the concept of Armature reaction.
  - (d) What will be the frequency of armature of a 6pole DC shunt generator running at 1000 rpm ?
  - (e) Draw the phasor diagram of single phase transformer on no load and explain.
  - (f) Calculate the winding factor factor of a 3phase balanced winding having 36 stator slots, 4 poles and coil span 11 slots.
  - (g) How a synchronous motor is started ?
  - (h) Explain why the copper loss in a transformer is variable ?
  - (i) An induction motor always rotate below the synchronous speed, explain.
  - (j) What do you mean by critical speed of a DC shunt generator ?
2.
  - (a) A DC Shunt Motor runs at 450 rpm when taking 230 A at 110 V. Assume flux to be proportional to field current what will be the speed when taking 85 A at 210 V where  $R_a = 0.03$  ohm and  $R_{sh} = 45$  ohm ? 5
  - (b) Explain the concept of voltage build up of DC shunt generator by drawing OCC ? 5

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3. (a) A 4-pole lap-wound dc shunt generator has a useful flux per pole of 0.07 wb. The armature winding consists of 220 turns, each of 0.004 ohms resistance. Calculate the terminal voltage when running at 900 rpm, if the armature current is 50 A. 5
- (b) What do you understand by commutation process in a DC machine? Also explain how inter poles help in improving this commutation process? 5
4. (a) Explain the procedure for conducting open circuit test of single phase transformer in the laboratory by drawing necessary circuit diagram? What is the significance of this test? 5
- (b) A 60 KVA single phase transformer has a full load primary current of 200 A and total resistance referred to primary is  $0.06 \Omega$ , if the iron loss amounts to 200 W, Find the efficiency on full load and half load at 0.8 power factor. 5
5. (a) How much copper can be saved in an autotransformer in comparison to conventional two winding transformer? 4
- (b) What is 'V curves' for a three phase synchronous motor and explain in brief. 3
- (c) A 6-pole alternator running at 1000 rpm supplies to an 8-pole induction motor. Find the actual speed of the motor if the slip is 2.5%. 3
6. (a) Draw the torque slip characteristic of a three phase induction motor, explain it in brief. 5
- (b) A 6 pole, three phase 50 Hz induction motor runs at full load speed of 960 rpm. What will be the total rotor copper loss and the gross mechanical power developed if the total air gap power available is 10 KW under full load? 5
7. (a) Explain the construction and principle of single phase capacitor start induction motor. 5
- (b) A 3 phase 16 pole star connected alternator has 192 stator slots with 8 conductor per slot. The coil span is  $150^\circ$  electrical. The sinusoidally distributed flux per pole is 0.065 Wb and the speed is 375 rpm. Determine the phase and line voltage. 5.
8. Write short notes on any two : 5×2
- (a) Four point starters
- (b) Stepper motors
- (c) Synchronisation of a generator.