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B.Tech
FEEE2215

4th Semester Back Examination 2018-19
ENERGY CONVERSION TECHNIQUES
BRANCH : CIVIL
Max Marks: 70
Time : 3 Hours
Q.CODE : F625

Answer Question No.1, which is compulsory, and any FIVE from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following Questions :** **(2 x 10)**

a) What are thefactors on which speed of the DCmotor depends?
b) Why the armature core in DC machines is constructed with laminated steel sheets instead of solid steel sheets?
c) What is the operating condition that results in maximum efficiency of transformer?
d) How can the direction of rotation of DC shunt motor reversed? Why should a DC series motor not operated without load?
e) How is synchronous motor started?
f) What is the advantage of delta connection over star connection in a three-phase transformer and vice versa?
g) The supply frequency of a6 pole induction motor is 50 Hz. The frequency of its rotor current is 2 Hz. What is the speed of the motor and its slip?
h) What are the types of Alternator based on their rotor construction? What is the speed of a 4-pole 50 Hz synchronous machine?
i) What is meant by synchronization of alternators? Name various methods of synchronizing alternators.
j) Why is it not possible for the rotor speed of an Induction motor to be equal to the speed of its rotating magnetics field?

Q2 a) Describe the voltage build up process in a dc shunt generator. **(5)**
b) A 4-pole, 240V, dc shunt motor takes a current of 2A when running at no- load speed of 1000 rpm. At full load, the motor takes 41A. Armature and field resistances are 0.2 ohms and 240 ohms respectively. Calculate the percentage drop in speed and speed regulation. **(5)**

Q3 a) Derive an emf equation of a dc machine. **(5)**
b) A dc generator has an armature emf of 100V when the useful flux per pole is 20mWb, and the speed is 800 rpm. Calculate the generator emf **(5)**
a. with the same flux and a speed of 1000rpm,
b. with a flux per pole of 24 mWb and a speed of 900 rpm.

Q4 a) A single phase transformer has total core loss of 1000 W at 420 V, 60 Hz and total core loss of 400W at 210 V, 30 Hz. Calculate the total core loss at 350V, 50 Hz and its two components. **(5)**
b) With the help of circuit diagrams, explain any two types of three-phase transformer connections **(5)**

Q5 a) A 4-pole, 50 Hz, 3-phase induction motor has no load slip of 1 % and full load slip of 4 %. Calculate : **(5)**
a. no load speed, b. full load speed,
c. frequency of rotor emf at standstill, d. frequency of rotor emf at no load and full load.
b) Draw the suitable sketches for the rotors of squirrel cage and slip ring induction motors. Describe their constructional details. **(5)**

Q6 **a)** Draw and explain the V-curves and inverted V-curves of a synchronous motor? **(5)**

b) Draw the equivalent circuit of a cylindrical rotor alternator, derive expressions for active power output for this alternator. **(5)**

Q7 **a)** Describe the construction and working of a capacitor-start single-phase induction motor. **(5)**

b) A 4-pole, 3 phase induction motor operates from a supply whose frequency is 50 Hz. Calculate the speed at which maximum torque occurs. **(5)**

Q8 **Write short notes on any TWO of the following :** **(5 x 2)**

a) Torque slip characteristics of 3 phase induction motor.

b) Speed current characteristics of a DC shunt generator Open circuit characteristics of dc generator.

c) Double field revolving theory of single phase induction motor