Aryabhatta Knowledge University

2013   ELECTRICAL MACHINE –II   F.M.-70

Attempt any five questions in which question no 1 is compulsory

1. Choose the correct option (any seven) :

A. Three –phase alternators are invariably connected in star so as to
i.Reduce the size of stator conductors used
ii.Increase the terminal voltage
iii.Reduce magnetic losses
iv.All of the above

B. The phase sequence of a three-phase alternator will reverse ,if
(i) The field current is reversed keeping the direction of rotation same
(ii)   The field current remains the same but direction of rotation is reversed
(iii) The field current is reversed and the number of poles is doubled
(iv) The number of poles is doubled without reversing the fields current

C. The regulation of an alternator of an alternator is given as
(i) $100(V-E_\circ)/V$
(ii) $100(E_\circ-V)/V$
(iii) $100V/E_\circ$
(iv) $100(E-V)/E_\circ$

(d)   In the measurement of X_d ,X_q (in ohms), following data are obtained by the slip test on salient pole machine:
I_d max=10A   , I_d min=6.5A   ,V_d max=30 V   ,V_d min=25 V
Which one of the following is correct?
(i) X_d=3   , X_q =3.86Ω
(ii) X_d=4.165   , X_q=2.5Ω
(iii) X_d=3   , X_q=2.5Ω
(iv) X_q=4.16Ω   , X_q=3.86Ω

(e)   In which of the following is reluctance power is developed?
i. Salient pole alternator
ii.Non salient pole alternator
iii. Squirrel cage induction motor
iv.Transformer

(f)   Which motor can conveniently operate at lagging as well as leading power factor?
i. Squirrel-cage induction motor
ii. Wound-rotor induction motor
iii. Synchronous motor
iv. Dc shunt motor

(g)   An inverted V curve of synchronous motor shows the variation of
(i)   Power factor and DC excitation at constant load
(ii)   Supply voltage and field current at constant excitation
(iii)   Power factor and supply voltage during hunting supply voltage and excitation current at constant load

(h)   A single-phase induction motor is running at N r.p.m. Its synchronous speed is N_s .if its slip with respect to speed is s, what is the slip with respect to the backward field?
(i)   S
(ii)   –s
(iii)   (1-s)
(iv) (2-s)

(i)   The torque-speed characteristic of two- phase induction motor is largely affected by
(i)   Voltage
(ii)   Speed
(iii)   X/R ratio
(iv) Supply frequency

(j)   In a.c. series motors, armature coils are usually connected to commutator
(i) Through resistor
(ii) Through inductors
(iii) through capacitors
(iv) solidly

2.   (a) draw the following phasor diagram of a 3 phase synchronous machine:
i. Type: non salient pole , mode generator , pf-lagging
ii. Type : salient pole ,mode motor ,pf –leading
iii. Type : non –salient pole,mode motor ,pf- leading

(b)   a 3 phase ,10 kVA ,400 V ,star connected alternator supplies the rated load at 0.8 p-f lagging. If the armature resistance is 0.5 ohm and synchronous reactance is 10 ohms , find the torque angle and voltage regulation.

3. (a) from the phasor diagram of a salient –pole alternator working at a leading pf , but with pf angle θ less than load angle   ,obtain the following relation:
i. $Tan(δ-θ)= [I_a X_q –V_t sin]/[V_t cos +I_a r_a]$
ii. $E_f =V_t cos +I_a r_a cos(-)+I_d X_d$

(b)   Find excitation voltage of an alternator when delivering rated output at 0.8 pf lagging and at a rated voltage. For this alternator ,X_d =1discuss the effects.25p.u. and X_q=1.00 p.u.

4. Show that for alternators running in parallel ,the divison load between them is governed mainly by the speed- load characteristics of their prime movers

5. (a) discus the effects of field current on synchronous motor power factor with the help of phasor diagram