GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

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Total Number of Pages : 2 **B.TECH**

4th Semester Regular Examination-April-May 2019

BELPC4010 – ELECTRICAL MACHINE-II

(Regulations 2017) Common to EEE,EE Branch

Time : 3 Hours Maximum : 100 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions) 10 x 2=20 Mark

Q.1. Answer *All* Questions.

a In an alternator, if the winding is short pitch by 60^0 electrical angle, its pitch factor will be [CO1] [PO1]
a) 1 b) 0.866 c) 0.75 d)0.288

b The starting torque of an 3-phase IM can be increased by increasing [CO5] [PO2]
a) Rotor resistance b) Rotor reactance c) Stator resistance d) Stator reactance

c In 3-phase IM , torque is related to supply voltage as
a) $T \alpha V^{1/2}$ b) $T\alpha V$ c) $T \alpha V^2$ d) $T \alpha 1/V$ [CO5] [PO2]

d In washing machines, most commonly used motors are [CO5] [PO2]
a) Split phase induction motor (IM) b)Slip ring IM c) Capacitor start IM d) Squirrel cage IM

e A 4-pole 50 Hz IM on full load runs at 1440 rpm. The slip speed will be [CO5] [PO2]
a) 1500 rpm b) 1440 rpm c) 120 rpm d) 60 rpm

f The maximum power in a synchronous machine is obtained when the load angle is [CO2] [PO1]
a) 0 degree. b) 45 degree. c) 90 degree. d) 120 degree.

g Crawling is a phenomena which occurs due to [CO5] [PO2]
a) Frequency Fluctuation. b)7th harmonics in flux wave. c) Low supply voltage. d) Heavy load.

h An alternator is said to be over excited, when it is operating at [CO4] [PO2]
a) Unity power factor (p.f.) b) Lagging p.f. c) Leading p.f. d) None of the above.

i If the armature reaction of an alternator produces magnetization effect on the main field, the power factor should be a) Unity. b) Zero lagging. c) Zero leading. d) None of the above. [CO4] [PO]

j In a synchronous motor, during hunting when the rotor speed exceeds the synchronous speed then damper bar develops [CO3] [PO1]
a) Induction generator torque. b) Harmonics. c) DC motor torque.d)Synchronous motor torque.

PART – B: (Short Answer Questions) 10 x 2=20 Marks

Q.2. Answer *ALL* questions

a Why do cylindrical Alternators operate with steam turbines? [CO2] [PO1]

b Mention the conditions necessary for parallel operation of alternators? [CO3] [PO1]

c What is the necessity for predetermination of voltage regulation in alternator? [CO1] [PO2]

d How synchronous impedance is calculated from OCC and SCC? [CO1] [PO2]

e How does change in excitation affects the load sharing? [CO3] [PO1]

f What is meant by infinite bus-bars? [CO1] [PO2]

g Why are centrifugal switches provided on many 1-phase Induction motors? [CO5] [PO2]

h Why is not possible for the rotor speed of an induction motor to be equal to the speed of its rotating magnetic field? [CO5] [PO2]

i Mention the methods of starting of three phase synchronous motor. [CO4] [PO2]

j What is the significance of damper winding in synchronous machines? [CO4] [PO2]

PART – C: (Long Answer Questions) 4 x 15=60 Marks

Answer *ALL* questions

Q.3

a With necessary phasor diagrams, explain the effect of increase in synchronous generator loads at (i) lagging power factor (ii) leading power factor upon its terminal voltage. [10] [CO1] [PO2]

b A 3-Phase, 50 Hz, star connected 2000 KVA, 2300V alternator gives a short circuit current of 600A for a certain field excitation. With the same excitation, the open circuit voltage was 900V. The resistance between the pair of terminal was 0.12 Ω . Find the full load voltage regulation at UPF and 0.8 p.f. lagging. [5] [CO2] [PO1]

OR

c Differentiate between salient pole type and cylindrical rotor type synchronous machines. [7] [CO2] [PO1]

d Define voltage regulation of an alternator? Explain the Synchronous impedance method for voltage regulation. Write down the advantages of this method. [8] [CO2] [PO1]

Q.4

a	A 480-V, 60-Hz, Δ connected, four-pole synchronous generator has a direct-axis reactance of 0.1 Ω, and a quadrature-axis reactance of 0.075 Ω. Its armature resistance may be neglected. At full load, this generator supplies 1200 A at a power factor of 0.8 lagging. **(a)** Find the internal generated voltage ($\mathbf{E_A}$)of this generator at full load, assuming that it has a cylindrical rotor of reactance **Xd** . **(b)** Find the internal generated voltage ($\mathbf{E_A}$)of this generator at full load, assuming it has a salient-pole rotor.	[10]	[CO2] [PO1]
b	Explain two reaction theory of synchronous generator. Draw the phasor diagram for direct axis and quadrature axis voltage drop of synchronous generator.	[5]	[CO2] [PO1]
	OR		
c	Explain the effect of change in field current on a synchronous motor in the context of 'V'curve and 'inverted V' curves.	[8]	[CO4] [PO2]
d	A 3300-V, 1.5 MW, 3-phase, star connected synchronous motor has $\mathbf{X_d}$=4Ω/phase and $\mathbf{X_q}$=3Ω/phase. Neglecting all losses, calculate the excitation e.m.f , when the motor supplies rated load at unity p.f. Also calculate the maximum mechanical power which the motor would develop for this field excitation.	[7]	[CO4] [PO2]

Q.5

a	A 208-V four-pole 60-Hz Y-connected wound-rotor induction motor is rated at 15 hp. Its equivalent circuit components are $R1$ = 0.220 Ω, $R2$ = 0.127 Ω ,X_M = 15.0 Ω $X1$ = 0.430 Ω , $X2$ = 0.430 Ω , Pmech = 300 W, Pcore = 200 W For a slip of 0.05, find *(a)* The line current I_L *(b)* The stator copper losses PSCL *(c)* The air-gap power PAG *(d)* The power converted from electrical to mechanical form Pconv *(e)* The induced torque (τind) *(f)* The load torque (τload) *(g)* The overall machine efficiency *(h)* The motor speed in revolutions per minute and radians per second	[10]	[CO5] [PO2]
b	With a neat diagram, explain the torque-slip characteristics of three phase induction motor with variation in rotor resistance.	[5]	[CO5] [PO2]
	OR		
c	Explain the procedure of determination of parameters of 3-ph induction from blocked rotor test.	[9]	[CO5] [PO2]
d	Write notes on (i) Cogging (ii) Crawling.	[6]	[CO5] [PO1]

Q.6

a	Explain the double field revolving theory for operation of single phase induction motor.	[7]	[CO5] [PO2]
b	Mention the major three techniques used to start a single phase induction motor. Briefly explain on any two techniques.	[8]	[CO5] [PO1]
	OR		
c	Explain the working principle of single phase induction motor. Mention four of its applications.	[7]	[CO5] [PO2]
d	How the parameters of single phase induction motors are evaluated from no load and blocked rotor tests?	[8]	[CO5] [PO2]

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