Registration no: | | | | | | | | | | |

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M.TECH
PEPE204

2nd Sem M. Tech Regular / Back Examination – 2014-15
ELECTRICAL ENERGY SYSTEM
BRANCH: POWER ELECTRONICS AND DRIVES
Time: 3 Hours
Max marks: 70
Q.CODE:T535

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 is power coefficient of a wind turbine?
b) How does a PV cell work?
c) What is TSR of a wind turbine?
d) What are different types of solar collectors?
e) What are the applications of wave energy conversion systems?
f) Why renewable energy resources are important in recent time?
g) What is yaw control in a wind turbine?
h) What is nacelle?
i) What are the applications of solar energy converters?
j) What are the factors governing output of solar energy converters?

Q2 a) With schematic diagram, explain the working of solar-thermal electrical power plant. (5)

b) Describe the solar water heating systems. (5)

Q3 Describe the construction, working and applications of different types of wind turbine. (10)

Q4 a) Discuss the process of voltage build-up in a self excited induction generator (6)

b) Calculate the required diameter of a wind turbine to generate 4 kW at a wind speed of 8 m/s and a rotor speed of 120 r.p.m. Assume power coefficient to be 0.45, efficiency of mechanical transmission to be 90%, efficiency of generator to be 95%. (4)

Q5 a) Calculate the total thrust force and aerodynamic power developed in a three blade wind turbine at a free wind velocity of 8 m/s. The machine specifications are as follows: diameter = 9 m, rotational speed = 100 r.p.m., blade length = 4 m, TSR = 5.23, chord length = 0.45 m (uniform throughout the blade), pitch angle = 5 °, lift coefficients for the aerofoil sections at 1m, 2m, 3m, 4m are 0.95, 1.20, 0.75, 0.46 and corresponding drag coefficients are 0.0105, 0.0143, 0.0092, 0.0078, respectively. (5)

	b)	Explain with power flow diagrams and power balance equations, the motoring operation and generating operation of a grid connected DFIG at both sub-synchronous and super-synchronous speeds.	(5)
Q6	a)	Prove the Betz limit for maximum efficiency of wind energy conversion systems.	(4)
	b)	Discuss different types of control mechanism of wind turbines.	(6)
Q7	a)	Compare synchronous generators with induction generators for suitability in wind power plant.	(5)
	b)	Explain a static reactive power compensation system.	(5)
Q8		Write notes on any **TWO**	(5 x 2)
	a)	Tidal energy	
	b)	Geothermal energy	
	c)	Biomass energy	