Ref. No. : EX/PE/T/414/2017(S)

B. Power Engineering 4th YR, 1ST SEM. Supplementary EXAM.- 2017
Subject: Non-Conventional Power Generation-II Time: Three Hours Full Marks: 100

Answer any FIVE questions

No. of Questions		Marks
1.a)	Briefly explain different electrical power generation schemes using wind turbine.	8
b)	Briefly explain showing the power coefficient (Cp) Vs. interference factor (a) for wind turbine.	4
c)	The horizontal axis wind turbine (HAWT) is installed at a location having wind velocity of 16 m/s. The 120 m diameter rotor has three blades attached to the hub. Find the rotational speed of turbine for optimum energy extraction.	8
2.a)	Briefly explain close loop wind power control technique for any variable speed wind turbine with block diagram.	10
b)	Draw a basic figure of vertical axis wind turbine.	2
c)	A propeller type wind turbine has the following data: speed of free wind at a height of 15 m is 18 m/s, air density is 1.45 kg/m^3, surface roughness (α) is 0.15, height of tower is 120 m, diameter of rotor is 80 m, wind velocity at turbine reduces by 10%, generator efficiency is 75%. a) Find total available wind power, b) power extracted by the turbine, c) electrical power generated, d) axial thrust on turbine, e)maximum axial thrust on turbine.	8
3.a)	State the constructional difference of major components are used in Ocean Thermal Power Plant (OTPP) in respect of those are used in conventional thermal power plant.	8
b)	State the ideal characteristics of working fluid that is used in OTPP along with name.	3+1
c)	Briefly explain how the markets had been developed regarding OTPP.	4
d)	Why sea water is corrosive & how this problem is rectified?	2+2
4.a)	Derive the expression of total wave power per unit width across wave front of water surface of natural ocean wave resource.	8
b)	What are the challenges have to be faced for extracting wave power?	4
c)	Calculate the following for deep Atlantic Ocean wave having wave length 50 m & amplitude 1.2 m, water density 1025 kg/m^3 :- i) Phase velocity, ii) Group velocity, iii) Total energy per unit area of wave surface, iv) Power develops per unit width across wave front.	8
5.a)	Classify & define geothermal region.	4

[Turn over

Ref. No. : EX/PE/T/414/2017(S)

B. Power Engineering 4th YR, 1ST SEM. Supplementary EXAM.- 2017
Subject: Non-Conventional Power Generation-II Time: Three Hours Full Marks: 100

Answer any FIVE questions

b)	Define: a) main features of tectonic plates, b) continental drift, c) temperature gradient	**3×2=6**
c)	Classify electrical power generation schemes using geothermal power & briefly explain any one scheme with a neat figure.	**2+8**
6.a)	For dry hot rock granite derive the expression of the following:- i) Useful heat content, ii) Time constant of heat extraction, iii) Heat extraction rate.	**4×3=12**
b)	Calculate the following of a dry rock granite to a depth of 7Km. Take the Geothermal temperature gradient is at 40°K/Km, minimum useful temperature is 140°K above the surface temperature T_o, rock density (ρ_r)=2700 kg/m^3, Specific heat capacity(C_r) =820 J/kg/°K. i) Useful heat content per square kilometer, ii) Time constant of heat extraction using water flow at a rate of 1 m^3/sec/km^2, iii) Useful heat extraction rate at initially & after 10 years. Assume water density 1000 kg/m^3& specific heat capacity 4200 J/kg/^{0}K.	**8**
7.a)	Briefly state the name of different energy storage methods with their examples.	**2+2=4**
b)	Briefly explain different major energy storage methods.	**16**