BE - sem-VIII - O H. Mech

NCES

21/12/15

QP Code : 2883

(REVISED COURSE)
(3 Hours)

[Total Marks: 100]

N.B. (1) Question No. 1 is **compulsory.**
(2) Attempts any **four** questions from remaining **six** questions.
(3) Draw **neat sketches** wherever necessary.
(4) Figures to the right indicate full marks.

1 (a) What is the importance of 'Non-Conventional Energy Sources' in the context of Present Energy Scenario? 8

(b) Explain energy status of India & Maharashtra and role of NCES. 8

(c) Define the solar constant. What is its value? 4

2 (a) Define and explain the followings:- 8
(a) Latitude (b) Hour angle (c) Declination (d) Day length

(b) Estimate the monthly average daily global radiation on a horizontal surface at Ratnagiri (16° 59' N, 72°05' E) during the month of March if the average sunshine hours per day is 9.5. Assume the values of a = 0.31 and b = 0.43. 7

(c) Find the days of the year on which the sun is directly overhead at 1200 h (LAT) at Pune (18°32'N). 5

3 (a) What is a Betz coefficient? Show that the maximum power coefficient is 59 % for a horizontal axis wind mill. 10

(b) The following data are given for a family biogas digester suitable for the output of 10 cows: the retention time is 30 days, temperature 30°C, dry matter consumed per day is 2 kg, and biogas yield is 0.24 m^3 per kg. The efficiency of burner is 60 %, methane proportion is 0.8. Heat of combustion of methane is 28 MJ / m^3. Calculate the volume of digester and the power available from the digester. Assume density of dry material in the fluid is 50 kg / m^3. 10

4 (a) A tidal power plant of the simple single basin type has a basin area of 30 × 10^6 m^2. The tide has a range of 12 m. The turbine however stops operating when the head on it fall below 3 m. Calculate the energy generated in one filling (or emptying) process, in kWh if the turbine generator efficiency is 73 %. 8

(b) Explain with neat sketches, how energy from Geothermal sources can be obtained in different ways. 5

(c) Propeller type wind turbine of 120 m diameter is running with 40 rpm at a velocity of 15 m/s with maximum efficiency. The atmospheric pressure is 1.01325 bar and the temperature is 15°C. Calculate: 7
(i) The total power density in the wind stream
(ii) The maximum obtainable power density
(iii) The total power.

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5 (a) Plot the variation of τ_r, τ_α and τ with the angle of incidence for the following cover system: 10

Material	: Glass
Number of cover	= 3
Thickness of each cover	= 4 mm
Refractive index of glass relative to air	= 1.52
Extinction coefficient of glass	= 15 m^{-1}

(b) Describe with a neat sketch the working of wind energy system showing the main components. Discuss advantages and disadvantages of wind energy conversion systems. 10

6 (a) Draw a neat diagram and explain working of a KVIC design of a biogas digester? 10

(b) How can wave energy be utilized? 10

7 Write short notes on any **four**:- 20

(a) Utilization of tidal energy
(b) Site selection considerations for wind mill
(c) Fuel cells
(d) Micro-hydro power generation
(e) Operational and environmental problems of geothermal energy.
