Total Number of Pages: 02

Course: B.Tech/IDD
Sub_Code: RME5D004

5th Semester Back Examination: 2025-26
SUBJECT: Non-Conventional Energy Sources
BRANCH(S): MECH, MMEAM, ME
Time: 3 Hours
Max Marks: 100
Q.Code : U480
Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1   **Answer the following questions:**   (2 x 10)

a) What do you understand by commercial energy?

b) State the main applications of flywheel energy storage.

c) What is the main advantage of using a glass cover in a box-type cooker?

d) Draw an equivalent circuit of a solar cell for (i) ideal and (ii) practical.

e) Define fill factor. What is the significance of fill factor?

f) Define Betz Criterion.

g) What do you understand about the stall state of an airfoil blade?

h) What do you mean by geopressured reservoirs? What is its significance?

i) Draw a neat sketch of a closed–cycle OTEC plant.

j) Define Pyrolysis in biomass.

Part-II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   (6 x 8)

a) What do you understand by energy conservation? Explain its various aspects.

b) What do you understand by greenhouse effect, and what are its consequences? How is it caused?

c) Explain a solar passive heating and cooling system with a neat sketch.

d) Calculate the number of daylight hours at Rourkela (22° 14' N) on 16 December and 14 January in a leap year

e) Explain the working principle of solar distillation.

f) Estimate the monthly average daily diffuse and beam radiation on a horizontal surface at New Delhi (28° 35' N, 77° 12' E). During the month of October, the average sunshine hour per day are 5 hours. Use (a = 0.35, b = 0.40 and

H_0 is equal to $\overline{H_0}$ on october 15, $H_0 = 3600 \times \frac{24}{\pi} \times I_{SC}\left(1 + 0.033\cos\frac{360n}{365}\right) \times$

$(\cos\phi\cos\delta\sin\omega_s + \omega_s\sin\phi\sin\delta)$ and $\frac{\overline{H_d}}{\overline{H_g}} = 1.354 - 1.57\overline{K_T}$, Where $\overline{K_T} = \frac{\overline{H_g}}{\overline{H_0}}$

g) With a neat sketch, write short notes on any two energy storage methods.

h) Explain the terms i) Yaw control, and ii) Pitch control with a neat sketch.

i) A two-blade HAWT is installed at a location with a free wind velocity of 30 m/s. The rotor diameter is 50 m. What rotational speed should be maintained to produce maximum output?

j) Explain the VI characteristics of a fuel cell.

k) Explain the working principle of the Binary hydrothermal system with a neat sketch.

l) With a neat sketch, explain the working principle of Pitching-type devices for the extraction of wave energy.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a)** Explain different types of concentric solar collectors. Also, differentiate between flat plate solar collectors and concentric solar collectors. **(8)**

b) Define declination angle, hour angle, zenith angle, azimuthal angle, and angle of incidence. **(8)**

Q4 **a)** Write the major applications of wind power. **(8)**

b) With the neat sketch, explain the working principle of a solar pond. **(8)**

Q5 Explain the tidal energy conversion schemes with proper layouts. **(16)**

Q6 **a)** What are the main advantages and disadvantages of biomass energy? **(8)**

b) With the help of a block diagram, explain the working of the MSW incineration plant. **(8)**