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Roll No. :

337652(37)

B. E. (Sixth Semester) Examination, April-May 2021

(New Scheme)

(Mech. Engg. Branch)

ENERGY SYSTEMS

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Part (a) of each question is compulsory. Solve any two from part (b), (c) and (d) of each question. Part (a) is of 2 marks & (b), (c) and (d) is of 7 marks each.

Unit - I

1. (a) Give two reasons why axial flow compressors are preferred over centrifugal compressors in jet engines. 2
- (b) Derive general thrust equation for jet engine. 7

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- (c) A turbo jet engine propels an aircraft at a speed of 900 km/hr when it develops a thrust of 14 kN. The air intake to the engine is 50 kg/s and its air fuel ratio is 85. The calorific value of the fuel supplied to the engine is 44000 kJ/kg. The isentropic enthalpy change in the nozzle is 150 kJ/kg. Find thrust, thrust power, propulsive power, propulsive efficiency and thermal efficiency of the engine. 7
- (d) Explain with diagram Pulse jet engine. 7

Unit-II

2. (a) Write the major difference between rocket engine and jet propelled air breathing engine. 2
- (b) A projectile has the following data : Initial mass = 200 kg, Mass of propellants = 70 kg, Operating period = 3 s, Average specific impulse = 2400 Ns/kg. find the mass ratio of the vehicle, propellant mass fraction, vehicle acceleration and total impulse. 7
- (c) Explain pressure fed liquid rocket engine with diagram and its limitations. 7

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- (d) Define the following : 7
- (i) Effective jet velocity
- (ii) Specific propellant consumption
- (iii) Impulse weight ratio

Unit-III

3. (a) What is solar constant and its value. 2
- (b) Explain the following terms with diagram : 7
- (i) Latitude
- (ii) Hour angle
- (iii) Declination
- (c) Calculate the sun's attitude and azimuth angle at 9 am solar time on sept. 1 at a latitude of 23°N on horizontal surface. 7
- (d) Describe how photovoltaic cells work, emphasis on PV module and PV arrays. 7

Unit-IV

4. (a) Explain in brief how biomass is converted into biomass energy. 2
- (b) What are the factors affecting generation of Biogas? 7

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- (c) How the site selection is done for wind energy conversion system. 7
- (d) What are the advantages and disadvantages of wind energy conversion system. 7

Unit - V

5. (a) What is OTEC? 2
- (b) Categories and explain in brief the resources of Geothermal energy. 7
- (c) Describe working principle and operation of fuel cells. 7
- (d) Explain open cycle MHD system with diagram. 7