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BME-031

02585

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER AIDED MANUFACTURING)

Term-End Examination

June, 2012

BME-031 : ENERGY CONVERSION

Time : 3 hours *Maximum Marks : 70*

Note : *Solve **any seven** questions.*
*Use of scientific calculator is **allowed.***

1. (a) A jet strikes a fixed curved vane at an angle of β and leaves it at an angle of α. The angles are measured between direction of jet and central line (normal to curve). What force will be acting on the vane along central line ? If vane is semi circular find force. **6**

(b) A symmetric vane moving with a speed of V_0 is struck by a jet of velocity V at angle α with the central line. Draw velocity diagrams at entry and exit and define all velocity components. **4**

2. (a) Define enthalpy of water, enthalpy of steam, latent heat and dryness fraction. Write expressions of enthalpy of steam in wet, saturated and superheated states. Define each term. 6

(b) Define triple and critical points for water. 4

3. (a) Distinguish between a fire tube and water tube boiler. Give examples. In which case the thickness of drum of water will be less if two types of same capacity are compared. Which boiler will have less reserved energy and why ? 6

(b) Show the shapes of fixed and moving blades in impulse and reaction turbine working on steam. 4

4. (a) In how many different ways the solar energy can be used for generating power ? Despite solar energy being free, use of solar energy for power is very less. Give reasons. Describe other applications of solar energy. 5

(b) What is bio-gas ? What are the sources of bio-gas ? How can we use bio-gas for power generation ? 5

5. (a) Steam at an absolute pressure of 0.6 Mpa is passed into a tank containing 60kg of water. The water equivalent of tank is 1kg water. The steam is condensed in the water from 15°C to 35°C. By weighing it is found that 22kg of steam condensed. Calculate the dryness fraction of steam. 5

(b) Show Rankine cycle on PV diagram. Determine the work done. How is this cycle modified ? Explain. 5

6. (a) How does a 2-stroke engine work ? Explain with sketch how inlet, power and exhaust strokes take place ? Why is fuel-air mixture first compressed in crank case ? 6

(b) Show the pressure variation in petrol engine cylinder as crank rotates. 4

7. (a) Define indicated and brake power of an engine. Also define mean effective pressure. Show how would you calculate IP ? 5

(b) Describe how BP of engine is measured in laboratory ? Why do you need to cool brake pulley ? 5

8. (a) What are different types of coal ? Which of these coals contains maximum moisture and which contains maximum carbon ? 5

(b) Describe the proximate and ultimate analysis of coal ? How do you find water content of coal ? Mention the liquid fuels that are used in boiler. 5

9. (a) Differentiate between Reheat and Regenerative cycles for power plants. 5

(b) Calculate efficiency of Otto cycle. 5

10. (a) What is the function of spark plug in a petrol engine? How does combustion occur in diesel engine ? Give simple sketch of spark plug. 5

(b) Differentiate between boiler mountings and boiler accessories. Give two examples and sketch one boiler mounting 5