B.Tech. (ME) 4th Semester (F. Scheme)

Examination, May–2015

STEAM AND POWER GENERATION

Paper–ME-210-F

Time allowed : 3 hours] *[Maximum marks : 100*

Note : *Attempt any **five** questions in total selecting at least **one** question from each section. **Question No. 1 is compulsory.** Each question carries equal marks. (20 marks)*

1. Explain the following :

(a) Use of steam table

(b) Classification of Boiler

(c) Fire Tube boiler

(d) Mechanical Draught

(e) Function of steam nozzles

(f) Mean effective pressure

(g) Thermal efficiency of steam engine

(h) Source of air leakage in condensers

(i) Calorific values of fuels

(j) Air pumps 20

Section–A

2. (a) Sketch the Rankine cycle on p-v and T-s plots. 6

(b) Is the thermal efficiency of a Rankine cycle equal to that of a Carnot cycle operating between the same temperature limits ? If it differ, explain the reasons for the same. 14

3. (a) Discuss the working of a locomotive boiler with the help of a neat sketch. Discuss the type of draught employed in this boiler. 14

(b) Write a short note on boiler accessories. 6

Section–B

4. (a) Define the nozzle efficiency. Explain its significance. What is the difference between the coefficient of discharge and velocity coefficient for a nozzle ? What is the relation between nozzle discharge and critical pressure ratio ? 14

(b) What are effects of friction on performance of steam nozzle ? 6

5. (a) Why compounding of steam engine is done ? State the method of compounding steam engine. 6

(b) A single cylinder double acting engine is supplied with dry and saturated steam of 11.5 bar and exhaust occur at 1.1 bar. The cut off occurs at 40% of the stroke if the stroke equals 1.25 times the cylinder bore and engine develops 60 kW at 90 rpm, determine the bore and stroke. Assume hyperbolic expansion and diagram factor of 0.70. Also calculate theoretical steam consumption per hour. 14

Section–C

6. A simple impulse turbine has a mean blade ring diameter of 70cm and runs at 3000rpm. The blade speed ratio is 0.46 and discharge is axial. The nozzle angle is 21° and blade friction factor is 0.95. Determine blade angles and theoretical specific power output. 20

7. (a) Discuss Binary vapour cycle working with the help of schematic and T-S diagrams. 14

   (b) Describe the regenerative feed heating cycle and pass out turbines in detail. 6

Section–D

8. (a) Estimate the condenser cooling water flow rates for a 400MW power plant if the water undergoes 10°C temperature rise. Assume overall plant efficiency 40% and boiler efficiency 80%. 10

   (b) Describe the working of surface and jet condenser. 10

9. (a) How you classify the various types of fuels ? Discuss each with their application. 10

   (b) Name the apparatus used for measurement of calorific value of gaseous fuels and discuss its working with the help of neat sketch. 10