Seat No.

W - 1311

Subject : Basic Mechanical Engineering Code : 59186 / 59942

F.E. SEM. – I and II (New Syllabus : Introduced from July 2013)

Day and Date : Monday, 26-05-2014 Time : 10 a.m. to 1.00 p.m.

Total Marks: 100

Instructions : 1) Solve any three questions from each Section.
2) Figures to the right indicate full marks.
3) Assume suitable data if necessary and indicate clearly.
4) Use of non-programmable calculator is allowed.

SECTION - I

Q.1 a) Define Internal energy. Prove that internal energy is a property of the system. 08

b) The velocity & enthalpy of fluid at the inlet of a certain nozzle are 50 m/s & 2750 kj/kg respectively. The enthalpy at the exit of nozzle is 2600 kj/kg. The nozzle is horizontal and insulated so that no heat transfer takes place from it. Find

1) Velocity of the fluid at exit of the nozzle.

2) Mass flow rate, if the area at inlet of nozzle is 0.1 m^2. Specific volume at inlet & outlet are 0.18m^3/kg and 0.498 m^3/kg.

3) Find the area at the exit nozzle. 10

Q.2 a) Write statements of first law of thermodynamics & State limitations of first law of thermodynamics. 08

b) In a steady flow machine 405 KW of work is done by the machine & the flow of fluid is 3 kg/s. The specific volume of the fluid, pressure & velocity at inlet are 0.37 m^3/kg, 6 bar & 16 m/s respectively. The inlet is 32 m above the floor & discharge pipe is at the level of the floor. The discharge conditions are 0.62 m^3/kg, 1 bar, & 270 m/s respectively. The total heat loss between the inlet & discharge is 9 KJ/kg of the fluid. Find the change in internal energy. 08

Q.3 a) Define following terms used in I.C. engines. 06

1) Dead centers.

2) Clearance volume & stroke volume.

3) Compression ratio.

b) Sketch the Otto cycle on P-v & T-S diagram. Derive an expression for its air standard efficiency (η) = $1-1/r^{(\gamma-1)}$. Explain that the efficiency of an air standard otto is a function of compression ratio only. 10

Q.4 a) Explain with neat sketch vapour compression refrigeration system. What are the advantages & disadvantages of it. 08

b) Explain with neat sketch vapour absorption refrigeration system. 08

SECTION II

Q.5 a) What is wind energy? Explain a typical wind mill with a neat sketch. 08

b) Draw a layout of hydroelectric power plant and explain its working? 08

Q.6 a) Explain with neat sketch Francis turbine. 06

b) A cross belt connects two pulleys of 500mm diameter, 2m apart. The initial tension in the belt is 500N, if the co-efficient of friction between belt and pulley is 0.3. Find the power transmitted at 700 rpm. Also calculate the length of belt. 10

Q.7 a) Define manufacturing process. Explain metal joining process with its application. 08

b) Define metal removing process. Explain Turning in detail. 08

Q.8 Write short notes on : 18

a) Tidal power plant.

b) Muff coupling and oldham's coupling.

c) Sand casting process.
