GANPAT UNIVERSITY
B.TECH SEM. I (ME, MC, CIVIL, EE)
REGULAR EXAMINATION NOV/DEC. - 2011
ME 101: ELEMENTS OF MECHANICAL ENGINEERING

TIME: - 3 HOURS   TOTAL MARKS-70

INSTRUCTIONS: (1) All questions are compulsory.
(2) Assume suitable data if necessary.
(3) Figure to the right indicates full marks.
(4) Scientific calculator, steam table is allowed.

SECTION - I

Que.-1 a Derive equation of a Polytropic process $W = (P_1V_1 - P_2V_2) / n-1$.   06
        b Determine specific volume and enthalpy of 1 kg of steam at 0.8 MPa (i) When the   06
           dryness fraction is 0.9 and (ii) When the steam is superheated to a temperature of
           280°C. Assume the specific heat of superheated steam is 2.1 kJ/kg K.

OR

Que.-1 a Explain the combined gas law and derive the $PV = mRT$ with diagram.   06
        b Explain the following terms: 06
           (i) Degree of super heat   (ii) Dryness Fraction (iii) Wetness Fraction (iv) Priming
           (v) Enthalpy of wet vapour (vi) Enthalpy of dry and saturated steam.

Que.-2 a Explain the working and construction of Cochran boiler.   06
        b Explain Carnot cycle and write their assumptions and limitations.   05

OR

Que.-2 a Explain Rankine cycle and derive its thermal efficiency equation.   06
        b Differentiation between boiler mountings and boiler accessories.   05

Que.-3 **Attempt Any Three Questions.**   12
        a Write advantages and disadvantages of liquid fuels over solid fuels.
        b What is prime mover? Explain various sources of energy with classification of
           prime movers.
        c Define the following terms:
           (i) Entropy   (ii) Enthalpy
           (iii) The Zeroth Law of Thermodynamic   (iv) First Law of Thermodynamic.
        d Explain the construction of Throttling calorimeter.
        e A gas enter a system at an initial pressure of 0.5 MPa and flow rate of 0.15 m³/sec
           and leaves it at a pressure of 0.95 MPa and flow rate of 0.09 m³/sec .During the
           passes through a system , the increase in internal energy of 22 kJ/sec. Calculate
           change in enthalpy of the medium.

SECTION - II

Que.-4   a   Explain the working of four stroke Spark Ignition engine.   06

         b   Following observations were recorded during a test on a single cylinder oil engine.   06
Bore = 300 mm, stroke = 450 mm, speed = 300 rpm, i.m.e.p. = 6 bar, net break load = 1.5 kN, Brake drum diameter = 1.8 m, brake rope diameter = 2 cm.
Calculate:
- (i) Indicated power
- (ii) Brake power
- (iii) Mechanical efficiency.

OR

Que.-4   a   Draw general Layout of I.C. engine and explain different components of I.C. engine.   06

         b   What is the function of I.C. engine? Give details classification of I.C. engine.   06

Que.-5   a   Derive an expression of workdone of single cylinder reciprocating compressor without clearance volume.   06

         b   What is priming? Explain with a neat sketch vane pump.   05

OR

Que.-5   a   A single stage, single acting compressor has a bore of 170 mm and stroke of 260 mm. It runs at 130 rpm. The suction pressure is 1 bar and delivery pressure is 9 bar. Find the indicated power if compression (i) follows the law $PV^{1.25}=C$ (ii) compression is isothermal. Also find isothermal efficiency. Assume there is no clearance volume.   07

         b   Different between single acting and double acting reciprocating pump   04

Que.-6   **Attempt Any Three Questions.**   12

         a   Classify governor and explain Pronell governor.

         b   Enlist and explain different types of belt derive.

         c   Differentiate between I.C. engine and E.C. engine.

         d   What do you meant by transmission of motion and Power?

END OF PAPER