Exam. No:_____

GANPAT UNIVERSITY
B.TECH SEM. IIND (CE/IT/EC/BM&I)
REGULAR EXAMINATION MAY/JUNE - 2012
ME 101: ELEMENTS OF MECHANICAL ENGINEERING

TIME: - 3 HOURS **TOTAL MARKS-70**

INSTRUCTIONS: (1) Attempt all questions.
(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 the following equations for constant pressure process with P-V diagram. **06**
(i) Workdone (ii) Change in heat transfer (iii) Change in enthalpy.

b Find out enthalpy and internal energy of 1 kg of steam at pressure of 10 bar (absolute) (i) When dryness fraction of steam is 0.70 (ii) When steam is superheated to 300°C. Specific heat of superheated steam is 2.1 kJ/kg K. **06**

OR

Que.-1 **a** One kg of air at 7 bar pressure and 90°C temperature undergoes a non flow polytropic process. The law of expansion is $PV^{1.1}$ = constant. The pressure falls to 1.4 bar during the process. Take R = 287 J/kg K and γ = 1.4 for air. Calculate (i) The final temperature (ii) Work done (iii) Change in internal energy (iv) Heat exchange. **06**

b Explain the working and construction of Throttling calorimeter with neat sketch. **06**

Que.-2 **a** Describe with neat sketch working and construction of the Cochran boiler. **06**

b Explain various processes of Carnot cycle with P-V diagram and derive efficiency equation of Carnot cycle. **05**

OR

Que.-2 **a** Describe with neat sketch the working principle and construction of Water level indicator. **06**

b An ideal Otto cycle has compression ratio of 9.5 and uses air as the working fluid. At the beginning of the compression process, air is at 1 bar and 17°C and 600 m^3. The temperature at the end of the expansion process is 800 K. Find out: (i) Highest temperature and pressure in the cycle (ii) Heat added (iii) The thermal efficiency. **05**

Que.-3 **Attempt Any Three.** **12**

a Classify the prime mover. Explain various sources of energy used by prime movers.

b What is calorific value? Explain H.C.V. and L.C.V.

c Explain the types of system with examples.

d Prove that $C_p - C_v = R$ with usual notations.

e Define boiler and give the function of the following components:
(i) Fusible plug (ii) Feed check valve (iii) Man hole (iv) Economizer.

SECTION-II

Que.-4	**a**	Explain the working of four stroke SI engine with diagram.	**06**
	b	A 6 cylinder four stroke petrol engine develops 200 kW brake power at 2500 rpm. Stroke to bore ratio is 1.2. If mean effective pressure is 10 bar and mechanical efficiency is 81%, calculate bore and stroke of the engine. Also calculate indicated thermal efficiency and brake thermal efficiency if 65 kg/hr of petrol is consumed having calorific value of 42000 kJ/kg.	**06**

OR

Que.-4	**a**	A 4 cylinder four stroke I.C. engine is to develop 80×10^3 W ip at 740 rpm. The stroke to bore ratio is 1.24:1. Assuming the mechanical efficiency of 80% and brake mean effective pressure of 4 bar, Find out the diameter and stroke of the engine.	**05**
	b	State and describe the major classification of I.C. engine.	**04**
	c	Write the function of the following components: (i) Cam shaft (ii) Fuel injector (iii) Fuel pump.	**03**
Que.-5	**a**	What is a positive displacement pump. Explain single acting reciprocating pump with neat sketch.	**06**
	b	Explain working of reciprocating compressor with neat sketch. Write applications of reciprocating compressor.	**05**

OR

Que.-5	**a**	A single stage air compressor draws 2 m^3 of air/min at 1 bar abs. and compress it according to the law $PV^{1.2}$ = constant to the delivery pressure of 5 bar abs. The compressor is driven by an electric motor having a power of 7.5 kW. Calculate the indicated power and mechanical efficiency. Assuming no clearance.	**06**
	b	Describe with neat sketch Split A.C. and write advantages over Window A.C.	**05**
Que.-6		**Attempt Any Three.**	**12**
	a	Explain the working principle of Watt governor.	
	b	Describe with neat sketch individual and group drive.	
	c	Define Refrigerating effect. Derive the equation 1 ton = 210 kJ/minute.	
	d	Describe with neat sketch working of centrifugal pump.	
	e	What do you mean by positive and non-positive displacement compressor? Give the examples of both types of compressor.	

END OF PAPER