

C.U.SHAH UNIVERSITY

WADHWAN CITY

University (Winter) Examination -2013

Course Name :B..Tech Sem-I

Subject Name: -Elements of Mechanical Engineering

Marks :70

Duration :- 2:30 Hours

Date : 23/12/2013

Instructions:-

- (1) Attempt all Questions of both sections in same answer book / Supplementary.
- (2) Use of Programmable calculator & any other electronic instrument is prohibited.
- (3) Instructions written on main answer Book are strictly to be obeyed.
- (4) Draw neat diagrams & figures (If necessary) at right places.
- (5) Assume suitable & Perfect data if needed.

SECTION-I**Q-1 Attempt the following:**

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|----|---|----|
| 1. | Define the term Pressure. | 01 |
| 2. | Distinguish between gas and Vapor. | 01 |
| 3. | What is non-flow process? | 01 |
| 4. | State the first law of thermodynamics. | 01 |
| 5. | Distinguish between heat and work | 01 |
| 6. | Define Dryness fraction. | 01 |
| 7. | List the essential components of heat engine. | 01 |
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|-----|--|----|
| Q-2 | (a) Derive Characteristic equation of perfect gas. | 04 |
| | (b) For adiabatic process prove $PV^\gamma = C$ | 05 |
| | (c) One kg of air at a pressure of 1 bar temperature of 27° C is compressed to a pressure of 10 bar adiabatically. Calculate work done. Take value of R = 0.287 kJ/kg K and $\gamma = 1.4$ | 05 |

OR

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|-----|--|----|
| Q-2 | (a) With neat sketch explain separating calorimeter. | 04 |
| | (b) Explain formation of steam at constant pressure with suitable sketch. | 05 |
| | (c) What amount of heat would be required to produce 3 kg of steam at a pressure of 7 bar and temperature of 300° C from water at 0° C, take $C_{ps} = 2.1$ kJ/kg K. | 05 |
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|-----|--|----|
| Q-3 | (a) Explain Carnot cycle and derive equation for the efficiency of Carnot cycle. | 07 |
| | (b) An air standard diesel cycle has compression ratio of 16 and expansion ratio 9. The pressure and temperature at the beginning of compression stroke is 1 bar and 25° C. The maximum temperature is 1200° C. Determine the thermal efficiency of cycle. | 07 |

OR

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|-----|---|----|
| Q-3 | (a) (1) Explain very briefly the function of following Boiler mountings :
(i) Steam stop valve (ii) Feed check valve (iii) Blow-off cock | 03 |
| | (2) Differentiate between
(i) Natural circulation and forced circulation in boiler.
(ii) Internally and externally fired boilers. | 04 |
| | (b) Explain with neat sketch construction and working of Cochran boiler. | 07 |

SECTION-II

Q-4 **Attempt the following:**

1. Define terms (1) clearance volume (2) Compression ratio 02
2. Give the uses of compressed air. 02
3. What is refrigerating effect? What is one ton refrigeration? 02
4. List the types of gear. 01

- Q-5 (a) Explain with neat sketch construction and working of vane type compressor. 04
- (b) Derive an expression for compressor without clearance $W = P V \log_e (P_2/P_1)$ for isothermal compression. 05
- (c) A single stage reciprocating air compressor draws 2 m^3 of air/min at 1 bar and compresses it according to the law $PV^{1.2} = C$ to the delivery pressure of 5 bar. Find the indicated power assuming no clearance. 05

OR

- Q-5 (a) Differentiate brake and clutch. Explain Band brake. 04
- (b) Differentiate between individual drive and group drive. 05
- (c) Explain window air conditioner along with its advantages. 05

- Q-6 (a) Explain with a sketch the working of a four stroke Diesel engine. 07
- (b) Following observations were recorded during a test on a single cylinder four stroke Petro engine. Bore = 100mm, Stroke = 125mm, Speed = 2000 r.p.m., i.m.e.p. = 2.6 bar, Net brake load = 39 N, effective radius of brake = 40 cm. Calculate: (i) Indicated power (ii) brake power (iii) mechanical efficiency 07

OR

- Q-6 (a) (1) Give comparison between a flywheel and a governor. 03
(2) Explain with sketch watt governor. 04
- (b) Give classification of pump and also explain with neat sketch the gear pump. 07

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