

Enrollment No.....



Faculty of Engineering
End Sem (Even) Examination May-2018
ME2CO07 Thermal Engineering

Programme: Diploma

Branch/Specialisation: ME

Duration: 3 Hrs.

Maximum Marks: 60

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

- Q.1
- i. The ratio of specific heat at constant pressure to that at constant volume is 1
 - (a) Equal to one
 - (b) Less than one
 - (c) More than one
 - (d) None of these.
 - ii. The ration of specific heat at constant pressure to specific heat at constant volume is known as: 1
 - (a) Adiabatic Index
 - (b) Thermal Efficiency
 - (c) Characteristic gas constant
 - (d) Universal gas constant
 - iii. Which of the following is a water tube boiler 1
 - (a) Lancashire
 - (b) Babcock and Wilcox
 - (c) Locomotive
 - (d) Cochran
 - iv. Device used to increase the temperature of saturated steam without raising its pressure is called 1
 - (a) Blow off cock
 - (b) Fusible plug
 - (c) Superheater
 - (d) Economiser
 - v. The steam leaves the nozzle at 1
 - (a) High pressure and low velocity
 - (b) High pressure and high velocity
 - (c) Low pressure and low velocity
 - (d) Low pressure and high velocity
 - vi. The ratio of workdone on the blades per kg of steam to the energy supplied to the blades is called 1
 - (a) Diagram or blading efficiency
 - (b) Nozzle efficiency
 - (c) Gross or stage efficiency
 - (d) Mechanical efficiency.

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- vii. The ratio of indicated thermal efficiency to the air standard efficiency is called **1**
 (a) Mechanical efficiency (b) Overall efficiency
 (c) Volumetric efficiency (d) Relative efficiency
- viii. The Morse test is used to find the indicated power of a **1**
 (a) Single cylinder petrol engine (b) Single cylinder diesel engine
 (c) Multi cylinder engine (d) None of these
- ix. The process of heat transfer from one particle of the body to another is called conduction when the particles of the body **1**
 (a) Move actually
 (b) Do not move actually
 (c) Effect the intervening medium
 (d) Do not effect the intervening medium
- x. The overall heat transfer coefficient is used in **1**
 (a) Conduction (b) Convection
 (c) Radiation (d) Conduction and convection
- Q.2 i. Explain Boyle's Law, with suitable mathematical expression. **2**
 ii. Show on PV diagram, that all the thermodynamic processes can be governed by the equation $PV^n = \text{Constant}$, with the various values of n . Why the value of n is always positive and for what value of n , adiabatic process becomes Quasi Static **8**
- OR iii. A gas having initial pressure, volume and temperature as 275 kN/m^2 , 0.09 m^3 and 185°C respectively, is compressed at constant pressure until its temperature is 15°C . Calculate the amount of heat transferred and work done during the process. Take $R = 290 \text{ J/kg K}$ and $C_p = 1.005 \text{ kJ/kg K}$ **8**
- Q.3 i. Give the classification of steam boiler. **4**
 ii. Explain with the neat sketch, the construction and working of a La-Mont Boiler **6**
- OR iii. The following data were taken during the test on a boiler for a period of one hour. (a) Steam Generated: 5000 kg (b) Coal Burnt: 700 kg **6**
 (c) CV: 31402 kJ/kg (d) Quality of Steam: 0.92

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- (e) Boiler Pressure: 1.2 MPa (f) Feed Water Temperature: 45°C . Find the boiler Equivalent evaporation and the Efficiency.
- Q.4 i. Give the functions of Nozzle and condenser **2**
 ii. Classify various types of condensers. Give the detailed construction and working of a down-flow condenser, with diagram. **8**
- OR iii. Differentiate between impulse and reaction turbines. What do you mean by the term relative velocity? **8**
- Q.5 i. Give the classification of Internal combustion engines. **2**
 ii. Discuss the cooling requirement of an IC engine. Describe the different methods of cooling and give specific examples where each method is employed. **8**
- OR iii. A four stroke petrol engine with a compression ratio of 6.5 to 1 and total piston displacement of $5.2 \times 10^{-3} \text{ m}^3$ develops 100 kW brake power and consumes 33 kg of petrol per hour of calorific value 44300 kJ/kg at 3000 rpm. Assume volumetric efficiency as 80%, $R = 287 \text{ J/kgK}$. One kg of petrol vapour occupies 0.26 m^3 at 1.013 bar and 15°C . Find **8**
 (a) Brake mean effective pressure
 (b) Brake Thermal Efficiency
 (c) Air standard efficiency and
 (d) air-fuel ratio by mass.
- Q.6 i. Define the term Thermal Conductivity. Give its unit and Dimensions **2**
 ii. Explain: **8**
 (a) Fourier's law of conduction
 (b) Newton's law of cooling
- OR iii. Define the following: **8**
 (a) Absorbptivity (b) Reflectivity (c) Transmissivity
 Also establish a relation between above terms.

Marking Scheme
ME2CO07 Thermal Engineering

Q.1	i.	The ratio of specific heat at constant pressure to that at constant volume is (c) More than one	1				
	ii.	The ration of specific heat at constant pressure to specific heat at constant volume is known as: (a) Adiabatic Index	1				
	iii.	Which of the following is a water tube boiler (b) Babcock and Wilcox	1				
	iv.	Device used to increase the temperature of saturated steam without raising its pressure is called (c) Superheater	1				
	v.	The steam leaves the nozzle at (d) Low pressure and high velocity	1				
	vi.	The ratio of workdone on the blades per kg of steam to the energy supplied to the blades is called (a) Diagram or blading efficiency	1				
	vii.	The ratio of indicated thermal efficiency to the air standard efficiency is called (d) Relative efficiency	1				
	viii.	The Morse test is used to find the indicated power of a (c) Multi cylinder engine	1				
	ix.	The process of heat transfer from one particle of the body to another is called conduction when the particles of the body (b) Do not move actually	1				
	x.	The overall heat transfer coefficient is used in (d) Conduction and convection	1				
Q.2	i.	Boyle's Law statement Mathematical expression.	1 mark 1 mark	2			
	ii.	PV diagram Derivation of various values of n Justification Value of n for Quasi-static process	3 marks 3 marks 1 mark 1 mark	8			
OR	iii.	Given data Calculation $Q = 28.311 \text{ KJ}$ $W = -16.925 \text{ KJ}$	2 marks 4 marks 1 mark 1 mark	8			
Q.3	i.	Any four classification of steam boiler.	(1 mark * 4)	4			
	ii.	Diagram Construction Working of a La-Mont Boiler	3 marks 1 mark 2 marks	6			
OR	iii.	Data from steam table Equivalent evaporation equation Equivalent evaporation 7.71 Kg/Kg of fuel Efficiency equation Efficiency 55.44 %	2 marks 1 mark 1 mark 1 mark 1 mark	6			
Q.4	i.	Functions of Nozzle Condenser	1 mark 1 mark	2			
	ii.	Classification of condensers Construction Working of a down-flow condenser Diagram	2 marks 1 marks 3 marks 2 marks	8			
OR	iii.	Any six difference between impulse and reaction turbines 1 mark for each (1 mark * 6) Relative velocity with formula	6 marks 2 marks	8			
Q.5	i.	Any three classifications of Internal combustion engines.		2			
	ii.	Requirement of cooling Any two methods with diagram & Application 3 marks each (3 marks * 2)	2 marks 6 marks	8			
OR	iii.	Given data and Calculation Brake mean effective pressure with formula Brake Thermal Efficiency with formula Air standard efficiency with formula Air-fuel ratio by mass with formula	2 marks 1.5 marks 1.5 marks 1.5 marks 1.5 marks	8			

Q.6	i.	Definition Thermal Conductivity	1 mark	2
		Its unit and Dimensions	1 mark	
	ii.	(a) Fourier's law with mathematical expression	4 marks	8
		(b) Newton's law with mathematical expression	4 marks	
OR	iii.	Define the following:		8
		(a) Absorbitivity	2 marks	
		(b) Reflectivity	2 marks	
		(c) Transmissivity	2 marks	
		Relation between above terms.	2 marks	
