HallTicket | | | | | | | | | | | Question Paper Code: AMEB09

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER

B.Tech IV Semester End Examinations

Regulations: IARE-R18

APPLIED THERMODYNAMICS-I

(MECHANICAL ENGINEERING)

Time: 3 hours **Max. Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1.	a)	Sketch the valve time diagram and explain valve timing diagram for a four stroke Otto cycle engine?	**[7M]**
	b)	What are the different variables that effects knocking in a CI engine can an operator usually able to control hose effects explain.	**[7M]**
2.	a)	Discuss the importance of cooling system for an IC engines. Describe different cooling systems?	**[7M]**
	b)	Explain the process of ignition delay of CI engine while representing on pressure time diagram.	**[7M]**

UNIT – II

3.	a)	(i) Explain the need for air motion and types? (ii) Factors influencing knocking in SI and CI engine?	**[7M]**
	b)	What are the harmful effects of overheating of an IC engine? Explain the problems occurring during overheating of IC Engine.	**[7M]**
4.	a)	What are the types of fuel injection systems? Explain anyone solid injection system with a neat sketch?	**[7M]**
	b)	Why firing order is important to run an IC engine. Mention firing order of four - stroke four cylinders, six cylinder engines.	**[7M]**

UNIT – III

5.	a)	Define the following terms: Indicated Power, Brake power, Friction Power, Mechanical efficiency, Mean effectiveness.	**[7M]**
	b)	The data recorded during the trial of a two stroke diesel engine are as follows: Engine speed=1500rpm Load on brakes =110kg brake arm = 900mm. Determine the following: (a) Brake torque, (b) Power available at the brakes of the engine	**[7M]**
6.	a)	Explain the phenomenon of knocking in SI engines. What are the different factors influencing the knocking?	**[7M]**
	b)	A four cylinder engine running at 1200rpm developed 25.3BHP. The average	**[7M]**

torque when one cylinder was cut out was 10.5kg_m. Determine the indicated thermal efficiency, if the calorific value of the fuel used is 10000kcal/kg, and the engine uses 0.25kg of petrol per BHP hour.

UNIT – IV

7. a) What do you mean by multistage compression? State the advantages of multistage compression? **[7M]**

   b) A single –stage, double-acting compressor has a free air delivery (FAD) of 14 m3/min. measured at 1.013 bar and 150C. The pressure and temperature in the cylinder during induction are 0.95 bar 320 C. The delivery pressure is 7 bar and index of compression and expansion, n=1.3.The clearance volume is 5 % of the swept volume. Calculate (i) Indicated power required (ii) Volumetric efficiency. **[7M]**

8. a) Describe with a neat sketch the construction and working of a single-stage single-acting reciprocating air compressor. **[7M]**

   b) A multi stage axial flow compressor delivers 20 kg/sec of air. The inlet stagnation condition is 1 bar and 17 0 C. The power consumed by the compressor is 4350 kW .Calculate (i) The delivery pressure (ii)Number of stages (iii) Overall isentropic efficiency of the compressor **[7M]**

UNIT – V

9. a) What are the different components of vapour compression system and explain with neat sketch. **[7M]**

   b) A refrigerator operating on stand vapour compression cycle has a coefficient performance of 6.5 and is driven by a 50 KW compressor. The enthalpies of saturated liquid and saturated vapour refrigerant at the operating condensing temperatures of 35 0 C are 62.55 KJ/Kg and 201.45 KJ/Kg. The standard refrigerant vapour leaving evaporator has an enthalpy of 187.53kJ/kg. Find the refrigeration temperature at compressor discharge. The Cp of refrigerant vapour may be taken to be 0.6155 kJ/kg ^{o}C. **[7M]**

10. a) State the functions of the following parts of a simple vapour compression system: compressor, condenser, expansion valve and evaporator. **[7M]**

    b) Ice is formed at 0°C from water at 20°C. The temperature of the brine is – 8°C. Find out the kg of ice formed per kWh. Assume that the refrigeration cycle used is perfect reversed Carnot cycle. Take latent heat of ice as 335 kJ/kg. **[7M]**

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COURSE OBJECTIVES:

The course should enable the students to:

I	Understand the construction and working of internal combustion engines, compressors and refrigeration systems.
II	Develop the concept of ideal and real working of thermodynamic cycles for performance evaluation
III	Understand the subsystems of internal combustion systems
IV	Knowledge of different refrigeration systems and air-conditioning systems using p-h charts.

COURSE LEARNINGOUTCOMES:

Students, who complete the course, will have demonstrated the ability to do the following:

S. No.	Description
AMEB09.01	Understand main idea and importance behind the 2 - S and 4 - S IC engines.
AMEB09.02	Analyze the working of the basic components in the IC engines.
AMEB09.03	Understand the combustion process and also how it does affect the performance of the IC engines.
AMEB09.04	Apply the thermodynamic principles in the design of an IC engines.
AMEB09.05	Formulate and perform the procedures required for the maintenance and operation of IC engines.
AMEB09.06	Compare different IC enginesand develop a system which meets the requirements.
AMEB09.07	Knowledge of Fuel Requirements and Fuel Rating.
AMEB09.08	Testing and Performance of I.C Engines.
AMEB09.09	Analyze the working of the basic components in the Compressors and Refrigeration systems.
AMEB09.10	Apply the thermodynamic principles in the design of Compressors and refrigeration system.
AMEB09.11	Formulate and perform the procedures required for the maintenance and operation of compressors and refrigeration systems.
AMEB09.12	Compare different compressors and refrigeration systems and develop a system which meets the requirements.
AMEB09.13	Understand the process of pressure enthalpy charts that are used in the Refrigeration systems.
AMEB09.14	Introduction to concepts of power and refrigeration cycles. Their efficiency and coefficients of performance.
AMEB09.15	Ability to use modern engineering tools, software and equipment to analyze energy transfer in required air-condition application.
AMEB09.16	Explore the use of modern engineering tools, software and equipment to prepare for competitive exams, higher studies etc.

Mapping of Semester End Examinations to Course Learning Outcomes:

SEE Question No.		Course Learning Outcomes		Blooms Taxonomy Level
1	a	AMEB09.04	Apply the thermodynamic principles in the design of an IC engines.	Understand
	b	AMEB09.02	Analyze the working of the basic components in the IC engines.	Remember
2	a	AMEB09.05	Formulate and perform the procedures required for the maintenance and operation of IC engines.	Understand
	b	AMEB09.04	Apply the thermodynamic principles in the design of an IC engines.	Remember
3	a	AMEB09.06	Compare different IC enginesand develop a system which meets the requirements.	Understand
	b	AMEB09.08	Testing and Performance of I.C Engines.	Understand
4	a	AMEB09.09	Analyze the working of the basic components in the Compressors and Refrigeration systems.	Understand
	b	AMEB09.07	Knowledge of Fuel Requirements and Fuel Rating.	Remember
5	a	AMEB09.10	Apply the thermodynamic principles in the design of Compressors and refrigeration system.	Understand
	b	AMEB09.11	Formulate and perform the procedures required for the maintenance and operation of compressors and refrigeration systems.	Understand
6	a	AMEB09.10	Apply the thermodynamic principles in the design of Compressors and refrigeration system.	Understand
	b	AMEB09.11	Formulate and perform the procedures required for the maintenance and operation of compressors and refrigeration systems.	Remember
7	a	AMEB09.13	Understand the process of pressure enthalpy charts that are used in the Refrigeration systems.	Understand
	b	AMEB09.10	Apply the thermodynamic principles in the design of Compressors and refrigeration system.	Remember
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	b	AMEB09.11	Formulate and perform the procedures required for the maintenance and operation of compressors and refrigeration systems.	Remember
9	a	AMEB09.14	Introduction to concepts of power and refrigeration cycles. Their efficiency and coefficients of performance.	Remember
	b	AMEB09.15	Ability to use modern engineering tools, software and equipment to analyze energy transfer in required air-condition application.	Remember
10	a	AMEB09.14	Introduction to concepts of power and refrigeration cycles. Their efficiency and coefficients of performance.	Remember
	b	AMEB09.15	Ability to use modern engineering tools, software and equipment to analyze energy transfer in required air-condition application.	Remember

Signature of Course Coordinator **HOD, Mechanical Engineering**

Mr. G Aravind Reddy, Assistant Professor