SIDDHARTH INSTITUTE OF ENGINEERING &TECHNOLOGY: PUTTUR

(AUTONOMOUS)

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QUESTION BANK (DESCRIPTIVE)

Subject with Code: Thermal Engineering (23ME0314) **Regulation:** R23

Branch: B. Tech - ME **Year & Sem:** III-B. Tech & I-Sem

UNIT – I
I C Engines

1	a)	State the definitions of an engine and a heat engine.	**L1**	**CO1**	**2M**
	b)	Describe the basic concept of an I.C. engine and an E.C. engine.	**L2**	**CO1**	**2M**
	c)	Name the main parts of an I.C. engine.	**L1**	**CO1**	**2M**
	d)	List any two functions of the piston and crankshaft in an I.C. engine.	**L1**	**CO1**	**2M**
	e)	Explain the functions of the valves in an I.C. engine.	**L2**	**CO1**	**2M**
2		Differentiate between I.C. and E.C. engines and outline the different classifications of I.C. engines with suitable examples.	**L4**	**CO1**	**10M**
3	a)	Why the internal combustion engines are widely used compare to external combustion engines.	**L4**	**CO1**	**5M**
	b)	What are the important basic components of an IC engines?	**L1**	**CO1**	**5M**
3	a)	With a neat sketch, illustrate any three parts of an I.C. engine.	**L3**	**CO1**	**5M**
	b)	Distinguish between a 2-stroke engine and a 4-stroke engine.	**L4**	**CO1**	**5M**
5		Describe with help of diagrams, the working principle of the two-stroke SI engine. What modifications required for the two-stroke CI engine?	**L2**	**CO1**	**10M**
6		Illustrate the working principle of a 4-stroke cycle CI engine with line diagram	**L3**	**CO1**	**10M**
7		Explain the working principle of 2-stroke CI engine with a suitable sketch.	**L2**	**CO1**	**10M**
8		Discuss the sequence of operations in a four-stroke cycle petrol engine with help of neat sketches?	**L2**	**CO1**	**10M**
9		Compare S.I engine with C.I engine.	**L4**	**CO1**	**10M**
10		Explain the significance of valve-timing and port-timing diagrams in I.C. engines with suitable neat sketches.	**L2**	**CO1**	**10M**
11	a)	Construct and describe the valve-timing diagram of a C.I. engine.	**L3**	**CO1**	**5M**
	b)	Show the theoretical and actual port-timing diagrams of an S.I. engine.	**L1**	**CO1**	**5M**

UNIT – 2
Cooling & Lubrication Systems

1	a)	State the need for a cooling system in I.C. engines.	**L1**	**CO2**	**2M**
	b)	Name any two types of cooling systems used in IC engines.	**L1**	**CO2**	**2M**
	c)	List out the demerits of mist lubrication system.	**L1**	**CO2**	**2M**
	d)	Explain the function of a contact breaker in an ignition system?	**L2**	**CO3**	**2M**
	e)	Enumerate any two merits and two applications of electronic ignition systems.	**L1**	**CO3**	**2M**
2	a)	What are the main requirements of a cooling system in an internal combustion engine?	**L1**	**CO2**	**5M**
	b)	Differentiate between air cooling and liquid cooling systems with suitable examples.	**L4**	**CO2**	**5M**
3		What are the different types of cooling systems? Explain any two in detail.	**L2**	**CO2**	**10M**
4		Illustrate the following with neat sketches: (a) Thermosyphon cooling for IC engines. (b) Splash Lubrication of IC engines.	**L2**	**CO2**	**10M**
5	a)	Analyze the advantages and limitations of forced circulation cooling systems over air cooling	**L4**	**CO2**	**5M**
	b)	Explain the functions and requirements of lubrication system in I.C. engines.	**L2**	**CO2**	**5M**
6		Indicate the various types of lubrication systems and explain any two of them in detail.	**L2**	**CO2**	**10M**
7	a)	Enumerate the functions of an ignition system in an internal combustion engine.	**L1**	**CO3**	**5M**
	b)	Distinguish the magneto-coil ignition system from the battery-coil ignition system.	**L4**	**CO3**	**5M**
8		Briefly illustrate the construction and working of a battery-coil ignition system with a neat sketch?	**L3**	**CO3**	**10M**
9		Describe Magento-coil ignition system with a neat sketch with its merits and demerits.	**L2**	**CO3**	**10M**
10		Discuss the contact-breaker and contactless (trigger-based) electronic ignition systems with suitable diagrams.	**L2**	**CO3**	**10M**
11		Evaluate the importance of spark advance and retard mechanism in engine performance.	**L4**	**CO3**	**10M**

UNIT – 3
Fuels and Combustion

1	a)	What is meant by fuel rating?	**L1**	**CO4**	**2M**
	b)	State two functions of an air and fuel filter.	**L1**	**CO4**	**2M**
	c)	List any two advantages of gasoline injection system over carburetor system.	**L2**	**CO4**	**2M**
	d)	Outline any two differences between pre-ignition and knocking.	**L1**	**CO4**	**2M**
	e)	Name two important combustion chamber types used in S.I. engines.	**L1**	**CO4**	**2M**
2	a)	Describe the fuel supply system in a petrol (S.I.) engine with neat sketch.	**L2**	**CO4**	**5M**
	b)	Enumerate the functions of air filters and fuel filters used in S.I. engines	**L1**	**CO4**	**5M**
3		State the functions of a carburetor in a petrol engine. Describe the working of a simple carburetor with a neat sketch and state its limitations.	**L2**	**CO4**	**10M**
4		Compare the working of a mechanical fuel pump and an electrical fuel pump with neat diagrams.	**L4**	**CO4**	**10M**
5		Explain gasoline fuel injection system and state its advantages over carburetor system.	**L2**	**CO4**	**10M**
6		Illustrate the stages of combustion in S.I engine with a neat sketch of pressure-crank angle diagram.	**L3**	**CO4**	**10M**
7	a)	Define flame speed and describe the importance of flame speed in S.I. engines.	**L2**	**CO4**	**5M**
	b)	Outline the effect of various engine variables on SI engine knock.	**L1**	**CO4**	**5M**
8		Indicate the following factors that influence flame speed. (i) Turbulence (ii) Compression ratio (iii) Fuel-air ratio (iv) Engine output (v) Engine size.	**L2**	**CO4**	**10M**
9		What is meant by abnormal combustion? Explain the phenomenon of knock in SI engine and differentiate between knocking and pre-ignition	**L2**	**CO4**	**10M**
10		What are anti-knock additives? Explain their purpose, types, and how they improve the octane rating of SI engine fuels.	**L2**	**CO4**	**10M**
11	a)	Discuss the significance of fuel rating in S.I. engines.	**L2**	**CO4**	**5M**
	b)	What are the various types of combustion chambers used in SI engines? Explain them briefly.	**L2**	**CO4**	**5M**

UNIT – IV
Engine Combustion

1	a)	What is meant by ignition delay period?	**L1**	**CO5**	**2M**
	b)	State two factors affecting the delay period.	**L1**	**CO5**	**2M**
	c)	List out the two methods for reducing diesel knock.	**L1**	**CO5**	**2M**
	d)	Indicate the methods used to determine frictional power	**L2**	**CO5**	**2M**
	e)	Define a heat balance sheet.	**L1**	**CO5**	**2M**
2		Briefly describe the stages of combustion in a CI engine with a neat sketch of pressure-crank angle diagram.	**L2**	**CO5**	**10M**
3	a)	Define diesel knock. List its causes and how to minimize knocking in a C.I. engine.	**L1**	**CO5**	**5M**
	b)	State the meaning and significance of the ignition delay period and list the factors affecting it in a C.I. engine.	**L1**	**CO5**	**5M**
4		Illustrate with suitable figures the various types of combustion chambers used in C.I. engines. Differentiate between D.I. and I.D.I. combustion chambers.	**L4**	**CO5**	**5M**
5		List different performance parameters of an I.C. engine and explain any three in detail.	**L2**	**CO5**	**5M**
6	a)	Discuss the methods used for measuring: (i) cylinder pressure and (ii) fuel consumption	**L2**	**CO5**	**5M**
	b)	A single cylinder, four stroke cycle oil engine is fitted with a rope brake. The diameter of the brake wheel is 600 mm and the rope diameter is 26 mm. The dead load on the brake is 200 N and the spring balance reads 30 N. If the engine runs at 450 rpm, Determine the brake power of the engine?	**L3**	**CO5**	**5M**
7	a)	List the different methods used to determine friction power and indicated power of an engine, and give short notes on each.	**L2**	**CO5**	**5M**
	b)	A two-stroke cycle internal combustion engine has a mean effective pressure of 6 bar. The speed of the engine is 1000 rpm. If the diameter of piston and stroke are 110 mm and 140 mm respectively, find the indicated power developed	**L3**	**CO5**	**5M**
8		Following observations were recorded during a test on a single cylinder oil engine: Bore = 300 mm, Stroke = 450 mm, Speed = 300 rpm, i.m.e.p. = 6 bar, net brake load = 1.5 kN, brake drum diameter = 1.8 m, brake rope diameter = 2 cm. Compute: i) Indicate power, ii) Brake power, iii) Mechanical efficiency.	**L3**	**CO5**	**10M**

9	The following results refer to a test on a petrol engine: Indicated power = 30 kW, Brake power = 26 kW, Engine speed = 1000 rpm, fuel per brake power hour = 0.35 kg, calorific value of the fuel used = 43900 kJ/kg. Calculate: i) The indicated thermal efficiency ii) The brake thermal efficiency iii) the mechanical efficiency.	**L4**	**CO5**	**10M**
10	What is a meant by heat balance sheet? Explain the steps involved in preparing a heat balance sheet and draw a neat heat balance chart.	**L2**	**CO5**	**10M**
11	The following observations were recorded in a test of one hour duration on a single cylinder oil engine working on four stroke cycle. Bore = 300mm, Stroke = 450 mm, Fuel used = 8.8 kg, Calorific value of fuel = 41800 kJ/kg, Average speed = 200 rpm, m.e.p. = 5.8 bar, Brake friction load = 1860 N, Quantity of cooling water = 650 kg, Temperature rise = 22oC, Diameter of the brake wheel = 1.22 m. Estimate: i). Mechanical efficiency, ii). Brake thermal efficiency. Draw the heat balance sheet	**L4**	**CO5**	**10M**

UNIT –V

Air Compressors

1	a)	Define a reciprocating air compressor.	**L1**	**CO6**	**2M**
	b)	What is clearance volume in a reciprocating compressor?	**L1**	**CO6**	**2M**
	c)	Define the volumetric efficiency of a compressor.	**L1**	**CO6**	**2M**
	d)	Indicate two advantages of multi-stage compression with intercooling.	**L2**	**CO6**	**2M**
	e)	State the meaning of pressure drop in multi-stage compressors.	**L1**	**CO6**	**2M**
2		Describe the working of a single-stage, single-acting reciprocating air compressor with a neat sketch.	**L2**	**CO6**	**10M**
3		Derive the expression for work done for single stage single acting reciprocating compressor.	**L3**	**CO6**	**10M**
3	a)	State how are the air compressors classified?	**L1**	**CO6**	**5M**
	b)	Construct the expression for the volumetric efficiency of a single-stage reciprocating compressor neglecting clearance volume.	**L3**	**CO6**	**5M**
4	a)	Derive an expression for minimum work required for a two-stage reciprocating air compressors with perfect intercooling and neglect clearance volume.	**L3**	**CO6**	**5M**
	b)	What is meant by multi-stage compression? Enumerate the advantages of a multi-stage compressor over a single-stage compressor.	**L1**	**CO6**	**5M**
5	a)	Deduce the expression for the work done in a multistage reciprocating compressor with perfect intercooling.	**L4**	**CO6**	**5M**
	b)	Distinguish between reciprocating and rotary air compressor.	**L4**	**CO6**	**5M**
6		A single stage reciprocating compressor takes 1 m^3 of air per minute at 1.013 bar and 15°C and delivers it at 7 bar. Assuming that the law of compression is $pV^{1.35}$ = constant and the clearance is negligible, Calculate the indicated power.	**L3**	**CO6**	**10M**
7		A single stage reciprocating air compressor is required to compress 1 kg of air from 1 bar to 4 bars. The initial temperature is 27°C. Compare the work requirement in the following cases. i) Isothermal compression ii) Compression with PV 1.2 = const iii) Isentropic compression	**L4**	**CO6**	**10M**
8		In a two-stage air compressor the pressure are atmospheric 1.0 bar: intercooling 7.4 bar: delivery 42.6 bar. Assuming complete intercooling to the original temperature of 15^0C and compression index n = 1, find the work done in compressing 1 kg of air.	**L3**	**CO6**	**10M**

9		Estimate the work done by a two-stage reciprocation single acting air compressor to compress 2.8 m^3 of air per minute at 1.05 Bar and 10^0C to a final pressure of 35 bar. The intermediate receiver cools the air to 30^0 C and 5.6 bar pressure. For air take n=1.4.	**L5**	**CO6**	**10M**
10	a)	Explain the working of a root's blower compressors with a neat sketch.	**L2**	**CO6**	**5M**
	b)	Illustrate briefly a centrifugal compressor with a neat sketch.	**L3**	**CO6**	**5M**
11		Discuss the working of an axial-flow compressor briefly with a neat sketch and compare the merits and demerits of axial-flow and centrifugal compressor.	**L2**	**CO6**	**10M**

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