Q.6 Attempt any two:

i. Explain any two methods of supercharging. **5**

ii. Explain how supercharging helps to improve the power output of an engine. **5**

iii. Make thermodynamic analysis of a supercharged engine cycle. **5**

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Total No. of Questions: 6 *Total No. of Printed Pages:4*

Enrollment No.....

Faculty of Engineering

End Sem (Even) Examination May-2019

ME3CO15 I. C. Engines

Programme: B.Tech. 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. If L is the stroke and N is the rpm, mean piston speed of two stroke engine is **1**

(a) LN (b) LN/2 (c) 2LN (d) None of these

ii. For the same peak pressure and heat input **1**

(a) $\eta_{OTTO} > \eta_{DUAL} > \eta_{DIESEL}$ (b) $\eta_{OTTO} > \eta_{DIESEL} > \eta_{DUAL}$

(c) $\eta_{DIESEL} > \eta_{OTTO} > \eta_{DUAL}$ (d) $\eta_{DIESEL} > \eta_{DUAL} > \eta_{OTTO}$

iii. In SI engine maximum flame speed is obtained when the equivalent ratio is between **1**

(a) 1.1 and 1.2 (b) 1.0 and 1.1

(c) 1.2 and 1.3 (d) Less than 1

iv. With increase in compression ratio flame speed **1**

(a) Increases (b) Decreases

(c) Remains the same (d) None of these

v. In CI engines knocking tendency increases with **1**

(a) Increase in compression ratio

(b) Increase inlet temperature of air

(c) Decrease in compression ratio

(d) Increasing coolant water temperature

vi. The advantages of the indirect injection combustion chambers are **1**

(a) Low injection pressure

(b) Direction of spray is not critical

(c) Good cold starting performance

(d) Both (a) and (b)

vii. The range of mechanical efficiency for automobile engine is **1**
(a) 0 – 30% (b) 30 – 50% (c) 70 – 80% (d) 90 -100%

viii. Morse test is applicable for **1**
(a) Single cylinder SI engines
(b) Multi cylinder CI engines
(c) Single cylinder CI engines
(d) Multi cylinder SI engines

ix. Supercharging increases the power of the engine by **1**
(a) Increasing the charge temperature
(b) Increasing the speed of engine
(c) Quantity of fuel admitted
(d) Increasing the charge pressure

x. Volumetric efficiency of supercharged engine is **1**
(a) Between 100 - 110% (b) Between 90 – 100%
(c) Between 80 -90% (d) Between 70 – 80%

Q.2 i. Define the following terms **3**
(a) Displacement volume (b) Cubic capacity
(c) Firing order

ii. Explain the working of four stroke diesel engine with actual valve timing diagram. **7**

OR iii. In an CI engine working on a dual combustion cycle, pressure and temperature at the start of compression are 1 bar and 300 K respectively. At the end of compression, pressure reaches a value of 25 bar. 420 KJ of heat is supplied per kg of air during constant volume heating process and pressure becomes 2.8 bar at the end of isentropic expansion. Estimate the ideal thermal efficiency. **7**

Q.3 i. What is meant by abnormal combustion? Explain the phenomena of knock in SI engine. **4**

ii. What are various types of combustion chamber use in SI engine? Explain them briefly. **6**

OR iii. Discuss any six effect of engine variables on flame propagation. **6**

Q.4 i. What are the requirements of good combustion chamber in CI engines? **4**

ii. Explain the combustion process in CI engines by drawing P-ϴ diagram where ϴ is crank angle. **6**

OR iii. What is delay period and what are the factors (any six) that affect it? **6**

Q.5 i. Explain the principle involved in the measurement of break power. **3**

ii. A morse test on a 12 cylinder, two stroke CI engine of bore 40 cm and stroke 50 cm running at 200 rpm give the following readings: **7**

Condition	Brake load(N)	Condition	Brake load(N)
All firing	2040	7^{th} cylinder	1835
1^{st} cylinder	1830	8^{th} cylinder	1860
2^{nd} cylinder	1850	9^{th} cylinder	1820
3^{rd} cylinder	1850	10^{th} cylinder	1840
4^{th} cylinder	1830	11^{th} cylinder	1850
5^{th} cylinder	1840	12^{th} cylinder	1830
6^{th} cylinder	1855	All firing	2060

The output is found from dynamometer using the relation BP = WN/180 where W the brake load is in Newton and the speed N is in rpm. Calculate IP, mechanical efficiency and bmep of the engine.

OR iii. A gas engine working on four stroke constant volume cycle, give the following results when loaded by friction brake during a test of an hours duration: cylinder diameter 240mm , stroke length 480 mm, clearance volume 4450 x 10^{-6} m^3, effective clearance of the wheel 3.86 m , net load on brake 1260 N at overall speed of 226.7 rpm, average explosion/ min 77, MEP of indicator card 7.5 bar, gas used 13 m^3/h at 15^0C and 771 mm of Hg, LCV of gas 49350 Kj/m^3 at NTP, cooling jacket water 660 kg raised to 34.2^0C, heat lost to exhaust gases 8%. Calculate: **7**
(a) IP
(b) BP
(c) Indicated thermal efficiency
(d) Draw the heat balance sheet for the engine.

Marking Scheme
ME3CO15 I. C. Engines

Q.1	i.	If L is the stroke and N is the rpm, mean piston speed of two stroke engine is (c) 2LN		**1**
	ii.	For the same peak pressure and heat input (d) $\eta_{DIESEL} > \eta_{DUAL} > \eta_{OTTO}$		**1**
	iii.	In SI engine maximum flame speed is obtained when the equivalent ratio is between (a) 1.1 and 1.2		**1**
	iv.	With increase in compression ratio flame speed (a) Increases		**1**
	v.	In CI engines knocking tendency increases with (c) Decrease in compression ratio		**1**
	vi.	The advantages of the indirect injection combustion chambers are (d) Both (a) and (b)		**1**
	vii.	The range of mechanical efficiency for automobile engine is (c) 70 – 80%		**1**
	viii.	Morse test is applicable for (b) Multi cylinder CI engines (d) Multi cylinder SI engines		**1**
	ix.	Supercharging increases the power of the engine by (d) Increasing the charge pressure		**1**
	x.	Volumetric efficiency of supercharged engine is (a) Between 100 - 110%		**1**
Q.2	i.	1 mark for each	(1 mark * 3)	**3**
	ii.	Working of four stroke diesel engine	4 marks	**7**
		Actual valve timing diagram	3 marks	
OR	iii.	PV and TS diagram	2 marks	**7**
		Formula for efficiency	1 mark	
		Calculation foe thermal Efficiency	4 marks	
Q.3	i.	Abnormal combustion with diagram	2 marks	**4**
		Phenomena of knock in SI engine with diagram	2 marks	
	ii.	Types of combustion chamber use in SI engine Any three with diagram and explanation 2 marks each	(2 marks * 3)	**6**
OR	iii.	Any six effect of engine variables on flame propagation 1 mark for each	(1 mark * 6)	**6**
Q.4	i.	Any four requirements of good combustion chamber with example 1 mark for each	(1 mark * 4)	**4**
	ii.	Combustion process in CI engines	3 marks	**6**
		P-ɵ diagram in detail	3 marks	
OR	iii.	Delay period	1 mark	**6**
		Any six factors 0.84 mark for each (0.84 mark * 6)	5 marks	
Q.5	i.	Principle involved in the measurement of break power.		**3**
		Diagram	1 mark	
		Explanation	2 marks	
	ii.	Calculate IP	5 marks	**7**
		Mechanical efficiency	1 mark	
		bmep of the engine.	1 mark	
OR	iii.	(a) IP	1 mark	**7**
		(b) BP	1 mark	
		(c) Indicated thermal efficiency	2 marks	
		(d) Draw the heat balance sheet for the engine.	3 marks	
Q.6		Attempt any two:		
	i.	Any two methods of supercharging. 2.5 marks for each	(2.5 marks * 2)	**5**
	ii.	Supercharging helps to improve the power output of an engine. Explanation with factor		**5**
	iii.	P-V diagram	2 marks	**5**
		Thermodynamic analysis of a supercharged engine cycle.	3 marks	

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