

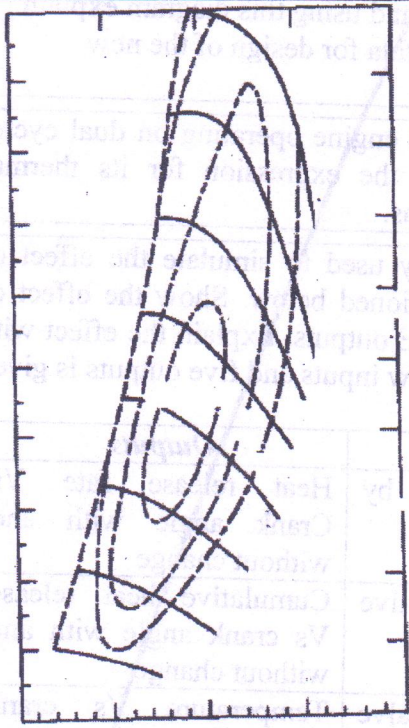
**College of Engineering, Pune**  
**End Semester Exam – May 2012**  
**F.Y. M. Tech. (Automotive Technology)**  
**Modeling of IC Engines**

Day & Date: Sunday, 13 May 2012  
 Maximum Marks: 50

Time: 09.00 am to 12.00 Nn  
 Duration –03.00 Hrs.

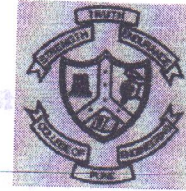
**Instructions:**

1. All the questions are compulsory
2. Assume suitable data wherever necessary

			Marks
Q. 1	A	Derive the linearised model for turbocharger shaft dynamics of a turbocharged diesel engine assuming the mean values of the engine variables. Assume the dependence of turbine torque $T_t$ on turbocharger speed $\omega_{tc}$ , engine speed $\omega_e$ , exhaust manifold pressure $p_{ex}$ , intake manifold pressure $p_{in}$ and the rack position $h$ . Assume the compressor torque $T_c$ to be a function of intake manifold pressure $p_{in}$ and the turbocharger speed $\omega_{tc}$ only.	5
	B		5
Q. 2	A.	Derive from engine geometry the total volume and change in volume per deg of crank angle.	4
	B.	The following equation is used to evaluate concentration of HC emission. Explain each parameter and give a brief write up on how to obtain parameters / variables for estimating HC emissions from SI	4

		engine. $\frac{d[\text{HC}]}{dt} = -6.7 \times 10^{15} \exp\left(\frac{-18,735}{T}\right) \bar{x}_{\text{HC}} \bar{x}_{\text{O}_2} \left(\frac{P}{RT}\right)^2$																			
Q. 3	A.	The conventional valve lift is characterized by open timing instant, maximum lift, and open duration period. For a conventional engine, the valve lift is described by a following function of these parameters and crank angle during an intake event. $L_v = ul \sin^2(180/ud)(\theta - ut)$ Where, $\theta$ = crank angle (degree) $L_v$ = valve lift (mm) $ul$ = maximum valve lift (mm) $ut$ = crank angle during open timing instant (degree) $ud$ = crank angle during open duration period (degree) Plot the variation of valve lift as a function of above parameters. Predict the effect of each of these parameters on the valve lift and thus on the performance of the engine.	4																		
	B.	Draw a typical pressure-theta diagram and using this diagram explain what analysis may be made using this data for design of the new engine?	4																		
Q. 4		Draw P-v diagram for a turbocharged engine operating on dual cycle. Show various processes and derive the expression for its thermal efficiency with air standard assumptions.	08																		
Q. 5		Commercially available software may be used to simulate the effect of following inputs on the outputs mentioned below. Show the effect of ANY TWO inputs on ALL THE FIVE outputs. Explain the effect with the help of a neat sketch(es). List of few inputs and five outputs is given as below. <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Sr. No.</th> <th style="text-align: center;">Inputs</th> <th style="text-align: center;">Outputs</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td>Spark timing of SIE by <math>\pm 10\%</math></td> <td>Heat release rate Vs Crank angle with and without change</td> </tr> <tr> <td style="text-align: center;">2</td> <td>Increase in intake valve lift by about <math>\pm 10\%</math></td> <td>Cumulative heat release Vs crank angle with and without change</td> </tr> <tr> <td style="text-align: center;">3</td> <td>Increase in intake valve lift by about <math>\pm 10\%</math></td> <td>Temperature Vs crank angle with and without change</td> </tr> <tr> <td style="text-align: center;">4</td> <td>Change in opening of intake valve by <math>\pm 10\%</math></td> <td>P-v diagrams with and without change</td> </tr> <tr> <td style="text-align: center;">5</td> <td></td> <td>NOx emissions with and without change</td> </tr> </tbody> </table>	Sr. No.	Inputs	Outputs	1	Spark timing of SIE by $\pm 10\%$	Heat release rate Vs Crank angle with and without change	2	Increase in intake valve lift by about $\pm 10\%$	Cumulative heat release Vs crank angle with and without change	3	Increase in intake valve lift by about $\pm 10\%$	Temperature Vs crank angle with and without change	4	Change in opening of intake valve by $\pm 10\%$	P-v diagrams with and without change	5		NOx emissions with and without change	08
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Q.6	A	Give step by step procedure of simulating GT Power model of a Turbocharged Diesel engine.	4
	B1	Write a short note on HCCI Engines.	2
	B2	Write a short note on applications of mean value model for electronic control design. Also explain the role of electronic control in modern IC engines.	2



**Sub: Automotive Electronics**

Date: 11.05.2012

Time: 9.00 to 12.00 hrs.

Max. Marks: 100

**Instructions:**

1. Figures to right indicate full marks.
2. Draw neat figures wherever required.
3. Answers to both the sections should be written in separate Answer sheets.

**Section - I**

**Q.1. Answer the following.**

1. Explain SI engine management system with neat sketch. (10)

2. Abbreviate and Explain the following (5)

- i. TPS
- ii. FI
- iii. IGN
- iv. ECS
- v. EPS

**Q.2. Answer the following.**

1. What are the different types of sensors used in an ECU? Explain the working of ECU? (5)
2. Give the types of sensors & their working principle used in following automotive systems (5)
  - i. Safety
  - ii. Comfort

**Q.3. Explain electronic fuel control system with neat sketch**

(10)

**Q.4. Answer the following.**

1. Explain the construction & working of following (10)
  - i. Camshaft position sensor (5)
  - ii. Knock sensor
2. What is engine control sequence? Explain in brief. (5)

**Q.5. Answer the following.**

(10)

1. Explain CI Engine management with neat sketch. (5)
2. Explain the construction & working of the following: (5)
  - i. Wheel speed sensor
  - ii. Magnetic Position Sensor

**Section - II**

- Q.1. Answer the following. (10)**
1. Explain PID based engine control system in an engine management system. (5)
  2. Explain need of sensors in automotive domain. Give type of sensors used and list of parameters measured. (5)
- Q.2 Differentiate Open loop & Closed loop system in automobiles (10)**
- Q.3 Abbreviate and Explain the following (10)**
- i. CRDI
  - ii. OBD-II
  - iii. GDI
  - iv. SCR
  - v. DOC
- Q.4 Answer the following. (10)**
1. Explain Idle speed control in a gasoline engine management system. (5)
  2. What is adaptive control? Explain with an example. (5)
- Q.5 List various types of actuators and parameters controlled in an EMS (10)**

**\*\*\*\*\* All the best \*\*\*\*\***

**COLLEGE OF ENGINEERING PUNE**  
**(An autonomous Institute of Government of Maharashtra )**  
**END SEMESTER EXAM**  
**Advances in Iron and Steel Making (PTA 502)**

**Programme: F.Y.M.Tech**

**Year: 2011-2012**

**Duration: 3 hours**

**Max. Marks: 50**

**Instructions: 1. Solve Any five questions**  
**2. Figures to right indicate full marks**  
**3. Assume suitable data if necessary, draw neat figures. Use of calculators is allowed.**

Q1	The liquid bath of EAF contains Fe, C, Si and Mn. How does removal of impurities decide the refining sequence if the bath is blown with oxygen?	10
Q2	Explain the basis of selection of deoxiders using Ellingham diagram. What is the mechanism in formation of nonmetallic inclusions? Could you recommend rare-earth metals for effective deoxidation? Justify.	10
Q3	Explain the thermal profile experienced during liquid metal processing right from EAF to LRF. Identify the various zones. How does temperature shoot up observed in EAF? Suggest suitable steps to control the temperature rise.	10
Q4	AOD process is used for making stainless steel. Using schematic of converter, explain the significance of blows given for refining of the liquid metal. Discuss the impact on compositional variation of important alloying elements during processing.	10
Q5	Enumerate the metallurgical factors in selection of continuous caster over ingot casting. How does Junghan's principle used for continuous caster mould? Discuss the effect of stroke length on heal time.	10
Q6	How does the equiaxed zone in continuous cast product be improved? Discuss the selection of electromagnetic stirrer and its role on cast product quality.	10



**Q.3. Answer the following. (10)**

1. List some 2W automotive components for which Conformity of Production is mandatory.
2. Discuss acceleration performance evaluation test of a vehicle other than 2W.
3. Explain in brief Spray suppression device test.
4. Discuss steering impact test.
5. Write brief note on bumper impact test.

**Q.4. Answer the following. (25)**

1. Explain the evaluation of Brake performance of 2 Wheeler.
2. Discuss different test perform on plastic fuel tank of vehicle.
3. Write a note on Waste Vehicle Life cycle.
4. Explain the evaluation of cooling performance of radiator.
5. Explain any four tests on safety glass of a Vehicle.

### Section - II

**Q. 1 Answer the following. (10)**

- A. Explain how technical classification of goods vehicles is done. What are the sub-categories? Give suitable examples (3)
- B. (1) Explain the definition of Battery Operated Vehicle  
(2) Explain the requirements for granting exemption for small 2 wheeler electric bikes (3)
- C. Fill in the blanks with suitable words/ phrases:
- a. Maximum haulage capacity of Power Tiller coupled to a trailer shall not exceed-----.
  - b. Category L1 means motorcycle with maximum speed not exceeding ---- and engine capacity not exceeding ----, if fitted with thermic engine
  - c. "Heavy Goods Vehicle" means any goods carriage the GVW of which or, or a tractor or a road roller, unladen weight of which exceeds-----.
  - d. Category M2 means a motor vehicle used for carriage of passengers, comprising ----- seats in addition to driver's seat and having maximum GVW ----- (4)

**Q. 2. Answer the following. (10)**

- A. (1) Explain the definition of Agriculture tractor.  
(2) What are different applications/ functions of such vehicles? (3)
- B Explain the terms  
(1) Transport Vehicle  
(2) Invalid carriage (4)
- C Match the following
- |                       |   |
|-----------------------|---|
| 1. AIS 053            | (a) Safety standards of components                          |
| 2. Rule 115/ 116      | (b) Approval of prototype of vehicles                       |
| 3. AIS 124            | (C) Automotive vehicles- Type, terminology                  |
| 4. Rule 96            | (d) Brakes  |
| 5. Chapter VII of MVA | (e) Emission of smoke, vapor, etc from motor vehicles       |
| 6. Rule 126           | (f) Construction, equipment and maintenance of vehicles (3) |



**Q. 3 Answer the following.**

(10)

- A. (1) Why is it necessary for India to participate in world harmonization of automotive regulations?  
(2) What are the efforts taken for achieving this objective? (4)
- B. Explain in brief the 3 Agreements, which are administered by UN-ECE WP.29 (3)
- C. State whether True or False
1. India is a signatory to 1998 agreement
  2. UN-ECE has headquarters at Brussels
  3. Total 11 GTRs are established till date (3)

**Q. 4 Answer the following.**

(10)

- A. How are safety and emission standards for approval of vehicle formulated in India? (2)
- B. Explain the specific roles of various government ministries in regulatory matters (2)
- C. Explain the terms "Type Approval" and "CoP" of vehicles. (2)
- D. Fill in the blanks with appropriate words/ phrases
- a. Mass emission standards BSIII for 2/ 3 wheelers came into effect on and from----
  - b. ----- standards are published by ----- on behalf of AISC committee
  - c. ----- is the Chairman of CMVR-TSC as SCoE committees
  - d. Test procedure for mass emission measurement is given in document called----- (4)

**Q. 5 Answer the following.**

(10)

- A. Briefly explain about different active safety devices fitted on a typical 2 wheeler vehicle (3)
- B. Explain what are the mandatory standards/ requirements related to driver seat of a passenger car (3)
- C. Match the following pairs
- |   |                 |
|---|-----------------|
| 1. Dimensions of vehicles               | a. AIS 065      |
| 2. Size and ply rating of tyres         | b. Rule 124 (A) |
| 3. Brakes for motor vehicles            | c. Rule 95      |
| 4. Reflex reflectors                    | d. Rule 93      |
| 5. Embossment of chassis & engine no.   | e. AIS 057      |
| 6. Safety components for agri. Tractors | f. Rule 96      |

(4)

\*\*\*\*\* All the best \*\*\*\*\*