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F.E. Semester-II (Revised Course 2007-2008)
EXAMINATION Nov/Dec 2019
Basic Mechanical Engineering

[Duration : Three Hours]

[Total Marks : 100]

Instructions:

- 1) Attempt in **all five** questions. Atleast **one** question to be attempted from **each** module.
- 2) Assume missing data, if **any** with proper justification.
- 3) Illustrate with neat sketches where appropriate

MODULE-I

- Q.1**
- a) Derive an expression for the first law of thermodynamics applied to a turbine. **5**
 - b) With the help of a P-V & T-S diagram, describe the various processes that can constitute the air standard Otto cycle. **5**
 - c) One kg of air at 1 bar and 300 K is expanded reversible adiabatically till its volume becomes 5 times its original volume. Then it is heated at constant volume and finally compressed at constant pressure to reach the initial condition. **10**
 - i) Show the process on P-V plane
 - ii) Cardinal points (P, V & T at each point on cycle)
 - iii) Find the heat and work transfer for each process
 - iv) Find the change in enthalpy and internal energy in each process
 - v) Find the ratio of heat added to the net work transfer. Comment on the result.
- Q.2**
- a) Answer the following: **12**
 - i) What is a heat pump? How does it differ from a refrigerator?
 - ii) What is the perpetual motion machine of second law? Is it so that such a machine can be constructed in actual practice?
 - iii) List down the assumptions made in air standard cycle.
 - iv) Define thermal efficiency of heat engine. Can it be 100 percent?
 - b) In an air standard diesel cycle the compression ratio is 15 and the fluid properties at the beginning of compression are 100 kPa and 300 K for the peak temperature of 1600 K. Calculate the cycle efficiency. **8**

MODULE II

- Q.3**
- a) Describe the working of a 4 stroke SI engine with a neat diagram. **8**
 - b) Write a short note on Multi-point Fuel Injection. **6**

6



- c) With the help of a neat sketch, explain the working of a vapour compression refrigeration system employed in a domestic refrigerator.

- Q.4**
- a) Compare between two stroke and four engines. 6
- b) Describe the working of a thermal power plant using a schematic diagram labeling all components. 6
- c) A four cylinder, four stroke, compression ignition engine has a compression ratio of 15 runs at 2500 rpm. At this speed it develops 50 kW of indicated output. The swept volume is 300 cc per cylinder. Assuming the engine operates on diesel cycle and having air standard efficiency as actual efficiency where in the fuel used has the calorific value of 42000kJ/kg, with cut off ratio 1.2. Calculate the following: 10
- Mass flow rate of the fuel(TFC)
 - Mass flow rate of air if air fuel ratio is 15
 - Specific fuel consumption (SFC)
 - Net work done per cycle per cylinder
 - Average piston speed

MODULE III

- Q.5**
- a) Draw the layout of complete transmission system for front engine rear drive vehicle. 6
- b) With a neat sketch, explain the construction and working of differential. 6
- c) Write short notes on the following: 8
- Automotive emissions and control
 - Constant velocity universal joint.
- Q.6**
- a) Write a short note on power steering system. 4
- b) State the functions of a clutch. With a neat sketch, explain the working of a single plate clutch. 8
- c) With a neat sketch, explain hydraulic brake system of a car. 8

MODULE IV

- Q.7**
- a) List the operations that can be carried out on a lathe. 4
- b) With neat sketches, explain open die and closed die forging processes. 6
- c) Describe the hydrostatic process with the help of a neat sketch. 6
- d) Compare between soldering and brazing processes. 4

- Q.8
- a) With a neat sketch, explain the laser beam welding process. 6
 - b) Explain the various steps involved in a sand casting process with a neat sketch. 6
 - c) Briefly explain the principle of rolling. Also explain the various rolling stand arrangements with neat sketches. 8