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

[Duration : Three Hours] **[Max.Marks : 100]**

N.B
i. Attempt in **all five** questions. Atleast **one** question to be attempted from each module.
ii. Assume missing data, if **any** with proper justification.
iii. Illustrate with neat sketches where appropriate.

MODULE I

Q.1
a) What is the difference between extensive and intensive properties? **03**
b) What are point and path functions? Give some examples. **03**
c) Derive the first law of thermodynamics applied to a boiler. **04**
d) Air initially at 70 kPa pressure, 900K temperature and occupying a volume of $0.1 m^3$ is compressed isothermally until the volume is halved and subsequently it goes further compression at constant pressure till volume is halved again. Sketch the process on P-v plot and calculate total work done and heat interaction for the two processes. Assume ideal gas behaviour for air and take $C_p = 1.005$ kJ/kgK and $C_v = 0.718$ kJ/kgK. **10**

Q.2
a) In an air standard diesel cycle, the compression ratio is 16. The compression begins at 1.5 bar, 300 K. The heat added is 3 MJ/kg. Representing the cycle on P-v plane, compute the following: **12**
i) Pressure and temperature at all corner points of the cycle
ii) Air standard efficiency
iii) Net work done in a cycle per kg of air
iv) Maximum theoretical efficiency
v) Cut off and hence percentage cut-off
b) An engine working on ideal Otto cycle has temperature and pressure at the beginning of compression as 25°C and 1.5 bar respectively. The peak pressure is 35 bar. If the thermal efficiency of the engine is 48% and $\gamma = 1.4$. Determine the pressure and temperature at salient points. **08**

MODULE II

Q.3
a) With the help of a neat sketch, explain the working of a vapour compression refrigeration system employed in a domestic refrigerator. **06**
b) Describe the working of a 4 stroke SI engine with a neat diagram. **08**
c) Find the brake thermal efficiency of an engine which consumes 5 kg of fuel in 20 minutes and develops a brake power 65 kW. The fuel has a heating value of 42000 kJ/kg. **06**

Q.4
a) Describe the lubrication system of internal combustion engine with the help of neat sketch. **06**
b) Define the following: **08**
i) Refrigerants
ii) Dryness of fraction
iii) Tonne of refrigeration
iv) Boiler
v) Condenser
vi) Turbine
c) Explain rankine cycle with T-S diagram. **06**

Q.5
a) State the functions of a clutch. With a neat sketch, explain the working of a single plate clutch. **08**
b) Draw the layout of a complete transmission system for the front engine rear wheel drive vehicle. **06**
c) Write short notes on the following: **06**
i) Propeller shaft
ii) Constant velocity universal joint

Q.6
a) Describe the main components of an automobile. **08**
b) What is a friction plate? Where is it located? What are the functions of the pressure plate? **04**
c) With a neat sketch, explain hydraulic brake system of a car. **08**

MODULE IV

Q.7
a) Explain the following lathe operations with the help of neat sketches showing the relative motion between the work piece and tool. **06**
i) Turning
ii) Taper turning
iii) Knurling
b) With a neat sketch, explain laser beam welding process. **06**
c) Define extrusion process. Explain forward and backward extrusion processes. **08**

Q.8
a) Describe the basic steps involved in sand casting process with a neat sketch. **06**
b) What is upset forging? Explain open and closed upset forging processes with neat sketches. **08**
c) Compare between soldering and brazing processes. **06**