

Hall Ticket Number:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Code No. : 22413

VASAVI COLLEGE OF ENGINEERING (*Autonomous*), HYDERABAD
B.E. (Mech. Engg.) II Year II-Semester Main & Backlog Examinations, May-2017

Applied Thermodynamics

Time: 3 hours

Max. Marks: 70

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A ($10 \times 2 = 20$ Marks)

1. Define volumetric and isothermal efficiency of an air compressor.
2. List out important advantages of a multistage compressor with intercooler over a single stage one.
3. What are the limitations of a simple carburetor?
4. How are internal combustion engines classified?
5. Explain briefly Octane rating of SI engine fuels.
6. What are the types of SI engine combustion chambers?
7. List out the differences between the jet and surface condensers.
8. List the boiler mountings.
9. Show the Rankine cycle on $p-v$ and $T-s$ plots.
10. Define nozzle efficiency and nozzle exit velocity.

Part-B ($5 \times 10 = 50$ Marks)

11. a) Develop the work done expression for a single stage compressor i) with clearance, and [5]
ii) without clearance.
b) A single stage reciprocating air compressor has a bore of 200 mm and stroke of 300 mm. [5]
It receives air at 1 bar and 20°C and delivers it at 5.5 bar. If the compression follows the law $PV^{1.3} = C$ and clearance volume is 5 % of the stroke volume, determine i) mean effective pressure and ii) power required if the compressor runs at 500 rpm.
12. a) Explain the operation of dry sump lubrication system with the help of neat sketch. [4]
b) The output of an I. C. Engine is measured by a rope brake dynamometer. The diameter [6]
of the brake pulley is 75 cm and rope diameter is 5 cm. The dead load on the light side of the rope is 41 kg and the spring balance reading is 5 kg. The engine consumes 4 kg/hr of fuel at rated speed of 1000 rpm. The calorific value of fuel is 44000 kJ/kg. Determine the brake power, brake specific fuel consumption and brake thermal efficiency.
13. a) Explain the combustion phenomenon in S.I. Engines with the help of $p - \theta$ diagram. [5]
b) What is meant by direct and indirect injection combustion chamber? Explain with the [5]
help of neat sketch the swirl combustion chamber of CI engine.
14. a) Explain the operation of fusible plug and feed check valve with the help of neat sketches. [6]
b) In a boiler, feed water supplied per hour is 205 kg while coal fired per hour is 23 kg. [4]
Net enthalpy rise per kg of water is 145 KJ for conversion to steam. If the calorific value of coal is 2050 KJ/Kg, determine the boiler efficiency.

15. a) Explain the effect of friction in nozzle flow with the help of $h-s$ diagram. [4]
- b) A group of convergent-divergent nozzles are supplied with steam at a pressure of 2 MN/m^2 and a temperature of $325 \text{ }^\circ\text{C}$. Supersaturated expansion according to the law $PV^{1.3} = \text{constant}$, occurs in the nozzle down to an exit pressure of 0.36 MN/m^2 . Steam is supplied at the rate of 7.5 ks/s . Determine the required throat and exit areas. [6]
16. a) Discuss a two stage compressor with a neat schematic diagram and also represent the processes on $p-v$ diagram. [5]
- b) During the testing of a 4-stroke oil engine fitted with a simple rope brake dynamometer the following readings were taken. [5]
- Brake wheel diameter = 60 cm , brake rope dia. = 2.5 cm , dead load on the brake = 200 N , spring balance reading = 50 N , speed = 450 rpm , area of the indicator diagram = 4.2 cm^2 , length of the indicator diagram = 6 cm , spring constant = 6 bar/cm , bore = 10 cm , stroke = 15 cm , bsfc = 0.3 kg/kWhr , calorific value of the fuel = 43960 kJ/kg . Determine the brake power, indicated power, mechanical efficiency, brake mean effective pressure and indicated thermal efficiency.
17. Write short notes on any *two* of the following:
- a) Knocking phenomena in C.I. engines [5]
- b) Surface condensers [5]
- c) Supersaturated flow in nozzles. [5]

