

11. (a) (i) Explain the first law of thermodynamics as referred to closed systems undergoing a cyclic change. (8)
- (ii) A heat engine is supplied heat at the rate of 1700 kJ/min and gives an output of 9 kw. Determine the thermal efficiency and the rate of heat rejection. (8)

Or

- (b) (i) Give the following statements of the second law of thermodynamics.
- (1) Kelvin plank statement (4)
- (2) Clausius statement. (4)
- (ii) During a certain flow process the internal energy per kg of the gas decreases by 160 kJ/kg and the flow work increases by 5000 kNm for 10 kg of the gas. Determine the change in total enthalpy and specific enthalpy. (12)

12. (a) Write short notes on the following :

- (i) Internal energy
- (ii) Free expansion and throttling. (8 + 8)

Or

- (b) Explain the Dual combustion cycle. Derive an expression for the efficiency of dual cycle. (8 + 8)

13. (a) Describe briefly and with appropriate sketches the actual sequence of events in the cylinder of a petrol engine working on the four stroke cycle. (16)

Or

- (b) State the classifications of steam engine. Briefly explain the working of a simple steam engine. (4+ 12)

14. (a) Sketch single slider crank chain and its various inversions, stating its applications. (16)

Or

- (b) (i) What do you understand 'fluctuation of energy' and 'maximum fluctuation of energy'? (4)
- (ii) Explain the procedure for the design of flywheel with the help of a turning moment diagram. (12)

15. (a) The initial tension in a flat belt drive is 1800 N. The angle of lap on the smaller pulley is 170° . $\mu=0.25$. The pulley has a diameter of 0.9 m and it runs at 450 rpm. Determine the power that can be transmitted at the above speed. Neglect the centrifugal tension. (10)

Or

(b) What is a gear train? Briefly explain the various types of gear trains. (10)

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