

J 1096

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2006.

Third Semester

Chemical Engineering

CH 234 — MECHANICAL ENGINEERING

(Common to Textile and Leather Technology)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State Kelvin Planck's statement of second law of thermodynamics.
2. What do you understand by entropy? Give its expression.
3. Draw the p-V diagram of an ideal diesel cycle clearly indicating the various processes.
4. Define brake thermal efficiency and volume efficiency of an I.C engine.
5. What do you understand by dryness fraction and superheated steam?
6. Mention the principle of impulse and reaction turbines.
7. What do you understand by kinematic link and kinematic pair?
8. Draw the turning moment diagram for a single cylinder double acting steam engine.
9. What is creep as applied to belt drives?
10. Why balancing of the rotating parts of the engine is necessary?

PART B — (5 × 16 = 80 marks)

11. (i) With a neat sketch explain the principle of operation of a four stroke spark ignition engine. (10)

(ii) List down the advantages of two stroke cycle engine over four stroke engine. (6)

12. (a) A piston and cylinder machine contains a fluid system which passes through a complete cycle of four processes. During a cycle the sum of all heat transfers is - 170 kJ. The system completes 100 cycles per min. Complete the following table showing the method for each item and compute the net rate of work output in kW. (16)

Process	Q (kJ/min)	W (kJ/min)	ΔE (kJ/min)
a-b	0	2170	-
b-c	21000	0	-
c-d	-2100	-	-36600
d-a	-	-	-

Or

(b) (i) Write down the steady flow energy equation clearly indicating the various terms. (6)

(ii) In a steam power station steam flows steadily through a 0.2 m diameter pipeline from the boiler to the turbine. At the boiler end the steam conditions are $p = 4$ MPa, $T = 673$ K, $h = 3213.6$ kJ/kg and $v = 0.073$ m³/kg. At the turbine end the conditions are $p = 3.5$ MPa, $T = 665$ K, $h = 3202.6$ kJ/kg and $v = 0.084$ m³/kg. There is a heat loss of 8.5 kJ/kg from the pipeline. Calculate the steam flow rate. (10)

13. (a) A gas engine operating on the ideal otto cycle has a compression ratio of 6 : 1. The pressure and temperature at the commencement of compression are 1 bar and 300 K. The heat added during the constant volume combustion process is 1170 kJ/kg. Determine the pressure and temperature at the salient points, work output per kg of air and air standard efficiency. Assume $C_v = 0.717$ kJ/kg - K, $C_p = 1.004$ kJ/kg - K and ratio of specific heats to be 1.4 for air. (16)

Or

(b) Discuss the working principle of a steam engine with a neat sketch. (16)

- (a) (i) Explain with a neat sketch the single slider crank chain mechanism. (6)
- (ii) Describe any two inversions found in single slider crank chain. (10)

Or

- (b) A riveting machine is driven by a constant torque 3 kW motor. The moving parts including the flywheel are equivalent to 1540 kg at 0.6 m radius. One riveting operation takes 1 second and absorbs 10000 joules of energy. The speed of the flywheel is 300 rpm before riveting. Find the number of rivets that can be closed per hour and the reduction in speed after the riveting operation is over. (16)

- (a) Obtain an expression for the length of a belt in an open belt drive. (16)

Or

- (b) Discuss the steps involved in the determination of magnitude and position of balancing several masses rotating in different planes using analytical and graphical method. (16)

he
(6)

a
he
K,
the
and
ne.
10)

sion
t of
ant
and
air
- K
(16)

(16)

1096