

00335

**DIPLOMA IN ELECTRICAL AND  
MECHANICAL ENGINEERING**

**Term-End Examination**

**December, 2010**

**BME-033 : HEAT POWER TECHNOLOGY**

*Time : 2 hours*

*Maximum Marks : 70*

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*Note : Answer five questions in all. Question number 1 is compulsory. Answer four more questions from remaining six questions. Use of calculator is permitted.*

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1. To every question four alternative answers are given, choose the correct one. **14x1=14**
- (i) In which of the following I.C engine is not used?
- (a) Aircraft.
  - (b) Domestic power generator.
  - (c) Domestic inverter.
  - (d) Locomotive.
- (ii) In SI engine, fuel and air are mixed in
- (a) crank case.
  - (b) combustion chamber.
  - (c) engine cylinder.
  - (d) carburetor.

- (iii) A connecting rod of an I.C engine is often
- forged.
  - cast.
  - machined to shape.
  - welded.
- (iv) Mean effective pressure of an engine is
- instantaneous pressure on piston after fuel burns.
  - pressure on piston averaged over entire stroke.
  - pressure on piston when it has travelled  $\frac{1}{2}$  - stroke.
  - pressure on piston at its BDC.
- (v) A single cylinder 2 - stroke engine rotating at N revolutions per second produces indicated mean effective pressure of  $p$  N/m<sup>2</sup> with piston stroke of l.m. If the indicated power is H,W and piston area on top is A then
- $H = \frac{pLAN}{60}$
  - $H = pLAN$
  - $H = \frac{pLAN}{60 \times 1000}$
  - $H = \frac{1000 pLAN}{60}$
- (vi) An accelerating pump in a carburetor helps fuel supply when
- engine is accelerating.
  - engine is starting from cold.
  - engine is running under steady load.
  - engine is about to stop.

- (vii) In which injector nozzle an auxiliary hole is provided in the nozzle body ?
- (a) Multi hole.
  - (b) Single hole.
  - (c) Pintaux type.
  - (d) Pintle type.
- (viii) Which is decreased due to super charging in an engine ?
- (a) Power output.
  - (b) Smoothness of operation.
  - (c) Mechanical efficiency.
  - (d) Specific fuel consumption.
- (ix) Which parts in a battery ignition system are rotated by engine?
- (a) Contact breaker cam and capacitor.
  - (b) Primary and secondary windings.
  - (c) Contact breaker cam and the distributor shaft.
  - (d) Capacitor and the distributor shaft.
- (x) Which of the following will increase engine friction ?
- (a) Increase in compression ratio.
  - (b) Decrease in rotational speed.
  - (c) Decrease in engine load.
  - (d) Increase in cooling water temperature.

- (xi) Holes are drilled in crankshaft of an engine to connect main bearing journal to crank pin for the purpose of
- (a) reducing weight of crankshaft.
  - (b) reducing vibration of crankshaft.
  - (c) allowing pressurized lubricant to flow from main bearing to crank pin.
  - (d) allowing lubricant to flow from crank pin to main bearing.
- (xii) In a thermosyphon cooling system of an engine
- (a) the cylinder and radiator are at same level.
  - (b) the radiator is at higher level than cylinder.
  - (c) the radiator is lower level than cylinder.
  - (d) there is no relationship between levels of radiator and cylinder.
- (xiii) The number of joints, J and number of pair's, P in a kinematic chain are related as
- (a)  $P - 2 = \frac{2(J+2)}{3}$
  - (b)  $P - 4 = \frac{J+2}{3}$
  - (c)  $2P - 2 = \frac{J+2}{3}$
  - (d)  $P - 2 = \frac{J+2}{3}$

- (xiv) When a gear is transmitting power, its tooth is subjected to
- compressive stress at root.
  - bending stress and compressive stress at root.
  - shearing stress at root.
  - shearing and bending stress at root.
2. A four stroke I.C engine runs at 720 rpm and develops an indicated mean effective pressure of 2.0 N/mm<sup>2</sup>. The cylinder diameter and crank radius respectively are 80 mm and 50mm. Calculate :
- 14**
- mean force on piston during power stroke.
  - work produced by engine during working stroke and in the following stroke.
  - indicated engine power and,
  - engine brake power if mechanical efficiency is 93%.
3. Sketch ignition system and describe the functions of the following.
- 4+(2<sup>1/2</sup>×4)=14**
- Primary and secondary coil.
  - Capacitor.
  - Distributor.
  - Contact breaker.
4. (a) Describe three lubricating systems used in I.C engines. Sketch one of the systems. **7+7=14**
- (b) Define viscosity of oil (lubricant ) and state how temperature affects viscosity and how does this affect engine performance ?

5. (a) What is a kinematic chain? State types of links and show them on sketch. A kinematic chain has 4 links. Calculate number of pairs and joints.  $8 + 6 = 14$
- (b) Sketch a four-bar chain and identify crank, coupler and follower. Also distinguish between input and transmission angles. What is the condition to be satisfied by sum of the lengths of largest and smallest links?
6. (a) Describe types of belts and materials in which they are made.  $4 + 10 = 14$
- (b) An electric motor of 10kW rotates at 750 rpm and carries a pulley of 200 mm diameter. A flat belt runs over motor pulley and a machine pulley which runs at half the rpm of motor. The angle of contact between belt and driving motor is  $120^\circ$  and coefficient of friction between pulley and belt is 0.3. Calculate :
- (i) belt speed in m/s
- (ii) ratio of tensions in tightside and slack side of the belt and
- (iii) the tensions in tight and slack sides of belt.
7. (a) Define pitch circle, circular pitch, diametral pitch, module and pressure angle for a gear
- (b) Sketch Watt governor,
- (c) Distinguish between functions of a governor and a flywheel.  $5 + 4 + 5 = 14$