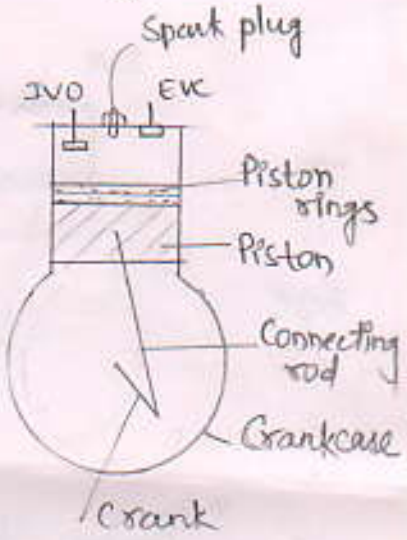
Model Answer Sheet – Class Test 3rd

Sub : EE (202)

Basic Mechanical Engg.

Ans(1) The engine in which cycle is completed in four strokes or two revolutions of the crankshaft, is called four stroke engine. Four stroke petrol engine works on Otto cycle.



1) Suction or Intake stroke :– (चूषण स्ट्रोक)

In this stroke piston moves from top dead centre (TDC) to bottom dead centre (BDC) and fresh air-fuel mixture is sucked into cylinder, producing vacuum pressure in cylinder & only intake valve is open.

TDC ↓ BDC

2) Compression (संपीडन) stroke :–

In this stroke both intake & exhaust valves are closed and piston moves from BDC to TDC. compressing the air-fuel mixture.

TDC ↑ BDC

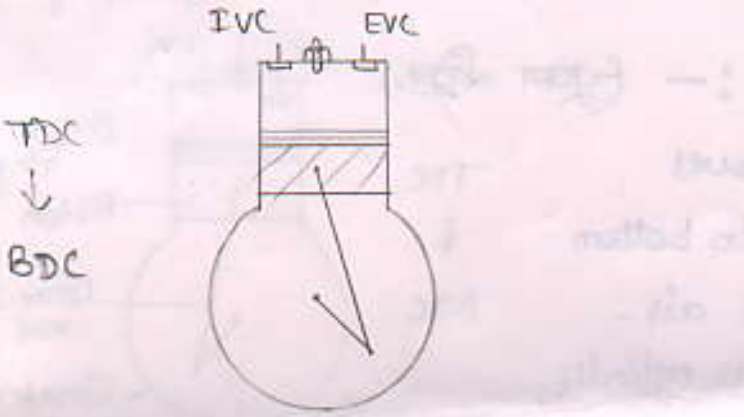
3) Working | Power | Expansion stroke (प्रसरण स्ट्रोक) :–

This is start of the second revolution of the four stroke cycle. In this, compressed air-fuel mixture is ignited by a spark plug, forcefully returning the

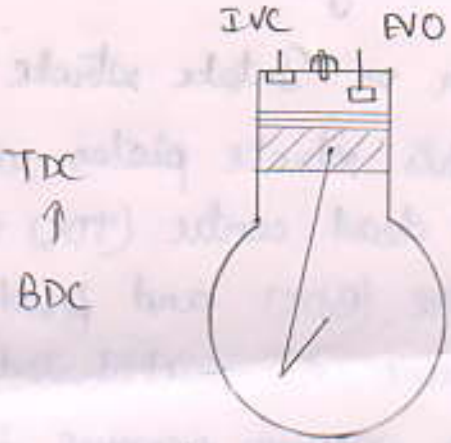
piston from TDC to BDC. This stroke produces mechanical work from the engine to turn the crankshaft.

) Exhaust stroke (~~एक्सहॉस्ट~~ एग्जॉस्ट) :—

During this stroke, piston once again returns from BDC to TDC, while the exhaust valve is open. This action expels the spent air-fuel mixture through the exhaust valve.



"Power Stroke"



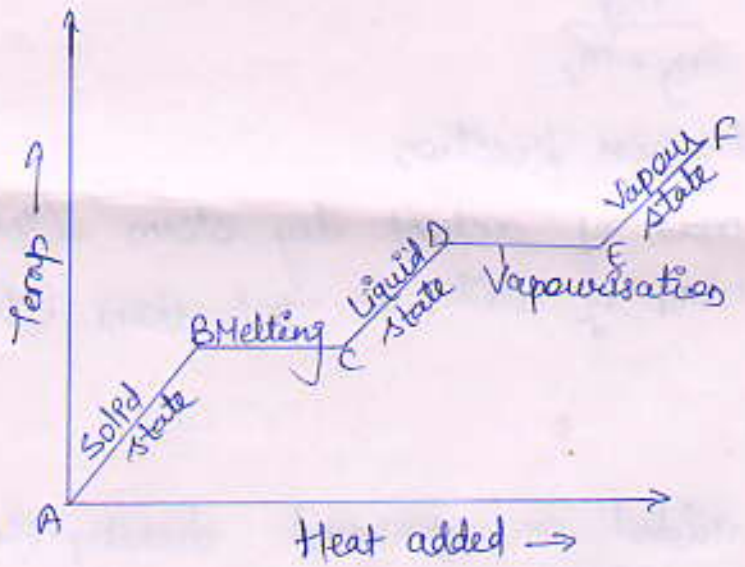
"Exhaust stroke"

Ans(2) (a) Difference b/w four stroke & two stroke engine —

Sr.	Description	4S engine	2S engine
1.	Completion of cycle	4 strokes or two revolutions of crankshaft	2 strokes or one revolution of crankshaft
2.	Flywheel	Heavy flywheel	Light flywheel
3.	Power produced for same size of engine	small (∵ 1 power stroke for 2 rev. of crankshaft)	high (∵ 1 power stroke for 1 rev of crankshaft)

Valve & valve Mechanism	Contains valve & valve actuating mechanism	Contains ports instead of valves
Compression ratio	High	Low
Weight	Heavier	Lighter
η_{mech}	Less	Higher
$\eta_{volumetric}$	More	less
Application	Used where efficiency is important	Used where low cost, compactness & light weight is important

(2)(b)



When an ice is heated at const. pr., the various stages during steam formation are shown in graph.

Stage A-B :- Rise in temp of solid substance in a solid state — Sensible heat (Heat added)

Stage - B-C :- Phase change from solid to liquid without rise in temp. — latent heat of fusion

Stage - C-D :- Rise in temp. of substance in liquid state

Stage D-E :- Phase change from liquid to vapour without rise in temp. - Latent heat of vaporisation

Stage E-F :- Rise in temp of substance in vapour state i.e superheating process

Ans (3)

(i) Dryness fraction :-

The ratio of the mass of dry steam in a certain quantity of steam to the mass of total ~~wet~~ wet steam, is known as "dryness fraction" of steam

$$x = \frac{m_g}{m_g + m_f}$$

where x = dryness fraction

m_g = mass of actual dry steam (gas)

m_f = mass of water in that steam (fluid)

(ii) Latent Heat :-

The heat added or removed during the change of state ie. solid → liquid, liquid → gas etc is known as Latent Heat. It depends upon pressure.

(iii) Tension ratio of belt drive :-

The ratio of tight side tension to the slack side tension in belt drive is known as tension ratio.

$$\frac{T_1}{T_2} = e^{\mu\theta}$$

where

T_1 = Tension in tight side

T_2 = " slack "

μ = Coeff. of friction b/w belt & pulley

θ = Angle of contact of belt with pulley

iv) Centrifugal tension in belt drive :-

The belt having mass runs over the pulley hence it is subjected to centrifugal force causing tension in belt, which is known as "Centrifugal tension".

It is negligible at lower speed but at higher speed its effect is considerable

$$T_c = mV^2$$

where m = mass of belt
V = Velocity of belt

v) Otto Cycle :-

An otto cycle is an idealized thermodynamic cycle which describes the functioning of a typical spark ignition or petrol engine.

It contains two constant volume process and two adiabatic process.

Const vol. process → 2-3 & 4-1
Adiabatic process → 1-2, & 3-4