

Internal Assessment Test 3 – Nov. 2019

Sub :	Railways, Harbours, Tunnels and Airports				Sub Code:	15CV552	Branch:	CIVIL
Date:	18/ 11 / 19	Durati on:	90 mins	Max Marks:	50	Sem/S ec	V-A/B	

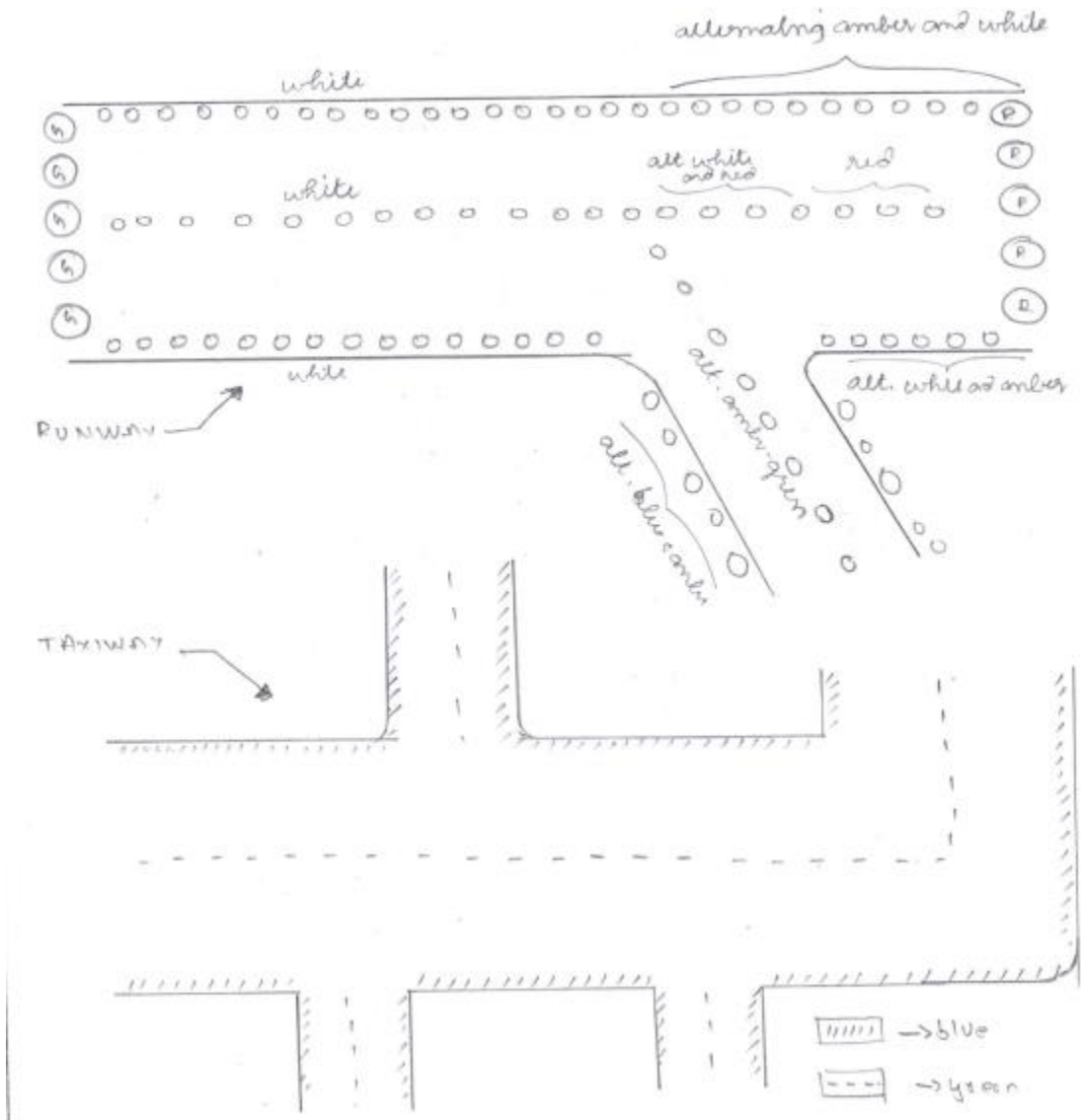
1. Explain Markings and lightings of runway and taxiway with neat diagrams. [10]

→ Markings

- * runway markings are done in white color
- * taxiway markings are done in yellow color
- * a single solid line is marked on the centre of the taxiway
- * two solid yellow lines are marked on the edges of the taxiway
- * near a runway taxiway intersection a hold sign represented by two solid yellow lines followed by two broken yellow lines, this is the indication / airport version of stop sign
- * adjacent to the taxiway, along the runway a runway holding sign (in red and white) along with runway number maybe present
- * aprons also have markings to guide the aircrafts to and from the taxiway in the right direction
- * runway direction (i.e. number) is marked along the runway.

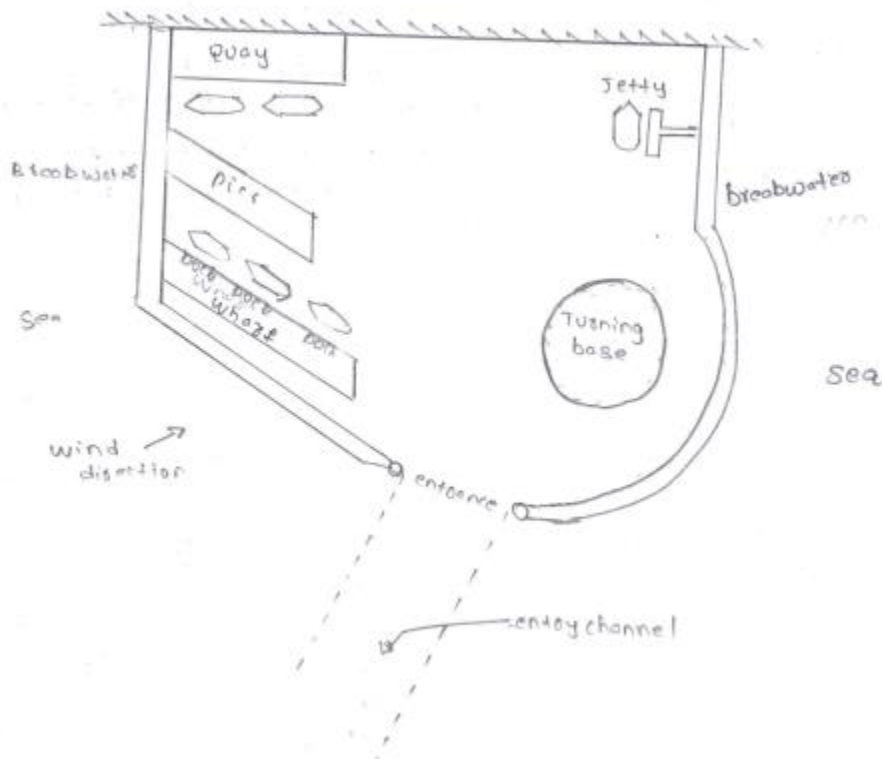
→ lightings

- * runways are edged with white lightings
- * taxiways are edged with blue lightings
- * runway threshold is indicated with red and green lights
- * amber and red indicate approaching the runway end
- * taxiway centre line is marked with blue green lighting



2.a) Draw and explain the layout of a harbor. [04]

a)



entrance: entrance is made wide and the depth of the water is also large

Turning base: It is the part where ships use for turning

Jetty: extended or protruded portion from the main harbour, supported on piers

Dock piers: where ships berth

Breakwater: part of water which is made protected from wind and waves, maintain calmer water

2.b) How will you select a harbor site [06]

- b) site selection for harbours depends on the following factors
- * availability of cheap land and construction materials
 - * natural protection by wind and waves
 - * transport and communication facilities
 - * industrial development of the local area
 - * sea bed, sub-soil and foundation conditions
 - * availability of electrical energy
 - * defense and strategic aspects
 - * traffic potentiality of the harbour

3. Explain the Geometric design of runways. [10]

3) Geometric design of runways

i) length of the runway

- runway length is determined based on the aircraft characteristics utilizing the airport
- base runway length is calculated based on
 - ii. normal landing condition
 - iii. normal takeoff condition
 - iii. ~~the~~ engine failure condition

For jet engine all 3 cases are considered. For piston engine cases i and iii are considered.

The engine failure speed is specified by the manufacturer and thus base runway lengths are determined

ii) width of runway

- * width of the runway should be from 23 to 45 m as per ICAO recommendations
- * the tip of the largest aircraft should not go above the shoulder as it is made of loose soil and may enter into the jet engine and damage it.

(ii) width of safety area

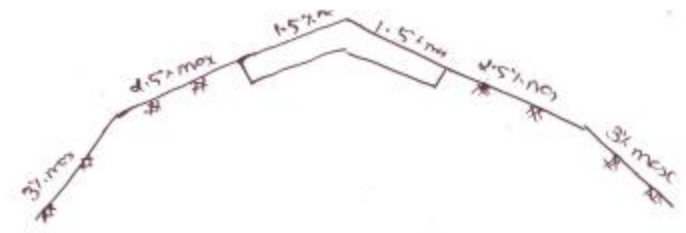
* safety area includes the area which is paved + shoulders
the area which is cleared and drained
* It is important to give the pilot a ~~vision~~ feeling of safety

- * width of safety area = 150m (for non ILS type of airport)
- * width of safety area = 300m (for ILS type of airport)

→ the length of the safety area is the runway length + 180m

(iii) Transverse gradient

- * quick drainage of water
- * no max. gradient & 1.5%
- * no min. specifications, but 0.5% is suggested
- * shoulders is divided into two, from centre line to 25m of shoulder, max 0.5% is permitted, thereafter 5% is permitted



(iv) longitudinal and effective gradient

For ABC type of airports

long gradient = 1.5%

effective gradient = 1%

for D.E type of airports

long. gradient = 0.1%

eff. gradient = 0%

effective gradient

is the diff. difference in heights of the highest and lowest points divided by the distance between them

vii) Rate of change of longitudinal gradients

* abrupt change affects visibility and smooth take-off or landing

* vertical curve must be provided for smooth change in gradient

* In A B C type of airports 0.1% every 30m is permitted

* In D.E type of airports 0.4% every 30m is allowed

viii) Visibility

* visibility is good in the runway

* but when there is a runway, taxiway intersection extra care must be taken to provide proper visibility as chances of accidents are more

* ICAO states that in A, B type of airports any point on the runway at a height of 3m must be visible mutually from a distance of atleast half the runway length

* 3.1m height for D.E type of airports

4. Explain the different types of tunnel ventilation [10]

a) Tunnel Ventilation

It is a process in which fresh air is blown in to the tunnel or foul air and dust are exhausted from the tunnel.

There are majorly two types of tunnel ventilation.

i) Natural ventilation

- + ventilation is achieved naturally due to the difference in temperature inside and outside the tunnel.
 - + It is more efficient when tunnel is excavated in the direction of the wind.
 - + It can be made more efficient by providing drifts at regular intervals.
 - + Disadvantages
 - quality of air cannot be controlled.
 - If there is any variation in the tunnel, then proper ventilation is not achieved.
- This calls for mechanical ventilation.

ii) Mechanical Ventilation

We use electric motor fans to blow fresh air into the tunnel or exhaust foul air and dust from the tunnel.

i) Blowing

- It includes blowing of air into the tunnel by using large electric fans.

- * pipes of diameter ranging from 30cm to 90cm are used to blow the air to the working face
- * this way dust and foul air gets ^{pushed} out from the tunnel through the opposite portal

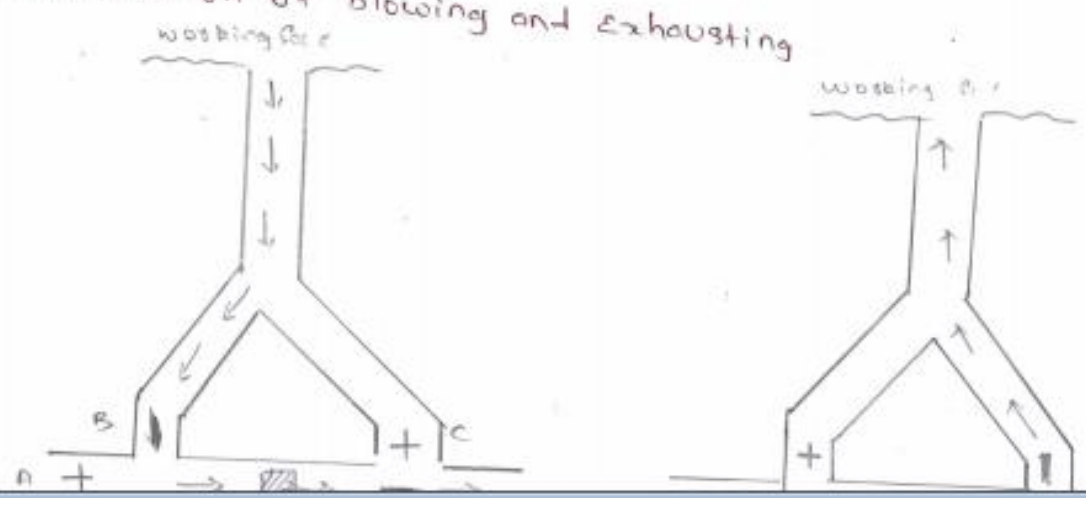
Disadvantages

- * In long tunnels, causes visibility issues
- * entrance to tunnel from other direction is unhealthy

ii) Exhausting

- * fans are used to suck out the air from the tunnels
- * hence dust and other particles exit the tunnel soon
- * used as soon after tunnel explosion

iii) Combination of blowing and exhausting



6. What do you mean by zoning? Explain. [10]

6) Zoning

* after the final site selection is made for the airport, suitable zoning laws are formed and implemented for the smooth functioning of the airports

* zoning can be categorized into two

i) Land use zoning

ii) height zoning

i) Land use zoning

this can further be classified into two

a) directly/indirectly related to aviation

terminal building, parking, runway, taxiway, apron all come under this category

b) non-aviation related zoning

* industrial, commercial and recreational activities should not interfere in the normal operation of the airport

* industries which produce smoke and dust affect the visibility conditions

* recreational centres such as golf courses can be provided suitably within the airport

* certain kind of crops which do not attract any birds are permitted

11) Height zoning

- This zoning is done to avoid any obstruction in the approach of an aircraft to the airport
- certain rules are laid out for the height of the structures surrounding the airport