

भारत मौसम विज्ञान विभाग
सूचना संचार एवं उपकरण प्रशिक्षण केंद्र नई दिल्ली
(विश्व मौसम संगठन का क्षेत्रीय प्रशिक्षण केंद्र नई दिल्ली)
Advance Training Course in Meteorological Instrumentation
&
Information System B-IX

Date: 04.03.2022

Final Exam (Paper-III)

Max. Marks -100
Time: - 10:30-13:30

Surface Instruments (Total 10 Marks)

Q1 (A) Fill in the blanks (1 Mark each) –any 4

- i. Surface temperature generally refers to free air at a height ofm.
- ii. In hair hygograph the length of hair used is approximately
- iii. Under standard conditions, a mercury column of 760 mm exerts a pressure ofhpa.
- iv. is defined as air in motion and is defined as degree of hotness.
- v. In hair hygograph the length of hair used is approximately.....
- vi. In Stevenson's screen, the bulb of maximum thermometer is generally kept downward at an angle ofto the horizontal.
- vii. is used in thermometer, barometers
- viii. Freezing point of mercury is°C and boiling point is°C

Q1 (B) Short Answer Type Questions (2 Marks each) – any 3

- i. Why mercury is used in thermometer, barometers etc.?
- ii. What exposure conditions should be ensured for setting up an observatory?
- iii. What is difference between sensor and detector?
- iv. What is difference between accuracy and precision of measurement?
- v. Why routine calibration of sensors is necessary?
- vi. Why maximum thermometer is kept tilted in the Stevenson's screen?

Aviation Instruments,AWS & ARG (Total 20 Marks)

Q2 (A) True or false with reasoning [2 Mark each] - any 5

- i. Meteorological visibility is a quantity to be estimated by an Instrument.
- ii. At aeronautical meteorological stations, the mean direction and speed of the surface wind should be measured and reported as two- and ten- minute averages
- iii. The ceilometer sensor may be installed near MBR room for measurement of base of the cloud.
- iv. Landing is not generally allowed when a crosswind component exceeds 45 kmph
- v. Pressure (QNH,QFE) is not measured at airport
- vi. Liquid precipitation (rain, drizzle) alone rarely reduces visibility into the RVR range.
- vii. Ultrasonic wind sensors are not used in airport.
- viii. Potentiometric wind vane is used for measurement of wind speed
- ix. DIWE is used for the instrumental measurement of RVR

Q2 (B) Short answer Type (2 Marks each) - any 5

- i. What is Meteorological optical range?
- ii. What is cross wind and how it is measured?
- iii. What do you mean by calibration of meteorological sensors at airport?
- iv. Define Koschmieder's law.
- v. What are site selection criteria for installation of Meteorological instruments at Airport?
- vi. What is principle of Optical anemometer and how it measured wind speed?
- vii. What is QFE and QNH and how these are measured at Airport ?
- viii. What is RVR and which instrument is used to measure it?
- ix. What is a ceilometer? Write down the working principle of it.

Satellite Meteorology (Total 50 Marks)

Q3 (A) Fill in the blanks: attempt any 4 (1 mark each)

- i. The spectral range of GOME-2 is -----
- ii. The main objective of GOME -2 is to provide information of -----
- iii. Wind speed and wind direction over ocean surface is obtained from -----
- iv. ASCAT is ----- (ACTIVE/Passive) type Scatterometer.
- v. AMSU is ----- (Active/passive) type radiometer

Q3 (B) True or false with reasoning- attempt any 3 (2 marks each)

- i. Argument of perigee is the angle measure in the orbital plane between ascending and the apogee.
- ii. An orbit with eccentricity equal to zero is an elliptical orbit.
- iii. INSAT-3D does not have microwave humidity sensor because it is not that accuracy compared to IR sensor.
- iv. Lightning imager in MTG uses brightness temperature measured from IR for detecting Lightning and thunder.
- v. GOME-2 measures earth backscattered radiation in IR and microwave region of the spectrum.

Q3 (C) Fill in the blanks with suitable answer- Attempt any 4 (1 Mark each)

- i. Multipath effects are removed by _____Antennae.
- ii. _____hrs. Orbital period of GPS Satellites are in orbit around the earth.
- iii. Weighted Mean temperature of the vertical atmosphere $T_m=55.8+0.77^*$ _____.
- iv. Tropospheric delay = Hydrostatic Delay+_____.
- v. _____ meters diameter antenna is used to receive the data from INSAT - 3D / 3DR satellite.
- vi. INSAT-3D & 3DR is a geostationary satellite and located at _____&_____ longitude and Imager & Sounder payloads of INSAT-3D/3DR satellite is having _____ frequency & _____frequency to receive the data

Q3 (D) True/False with suitable reason - Attempt any 3 (2 Marks each)

- i. The Antenna Control Unit (ACU) is used for steering the antenna either manually or automatically.
- ii. In the present ground receiving operational set of INSAT-3D/3DR is using Low Noise Amplifier (LNA) in extended C-Band.
- iii. Down converter converts the radio frequency (RF) to Intermediate Frequency (IF).

- iv. The serial data streams for Imager and Sounder received from Bit Synchronizer are fed to the DACQ Card/Frame synchronization through BNC to 5 Pin D connector.

Q3 (E) Fill in the Blanks-(1 Mark)-Attempt any 4

- i) Orbital period of geostationary satellite is Hours.
- ii) The INSAT 3DR satellite is located at°E.
- iii) The transfer of energy in the form of particle or waves and being the important source of energy for deriving all the atmospheric processes is
- iv) INSAT 3D is a type of satellite
- v) NOAA-17 is a type of satellite

Q3 (F) True/False with suitable reason (2 Marks)- Attempt any 3.

- i) INSAT 3D Water vapour channel resolution is of 4 Km.
- ii) Sea Surface Temperature product is standard full disk product
- iii) INSAT 3D Sounder uses sector A & sector B for land and ocean classification.
- iv) ROSA is payload of Metop Satellite

Q3 (G) Fill in the Blanks-(1 Mark)-Attempt any 4.

- i. IASI stands for _____.
- ii. INSAT 3DR is _____ (Active/Passive) type of satellite.
- iii. Sea Surface Temperature (SST) from INSAT-3D /3R is estimated by applying the _____ (moisture /albedo) correction.
- iv. Snow on ground/mountains can be detected using _____ channels.
- v. In the early stages of tropical cyclone, _____ pattern is generally observed.
- vi. _____ clouds are not detected by Visible channel.

Q3 (H) True/False with suitable reason (2 Marks)- Attempt any 3.

- (i) Cb clouds appear as very bright in all three VIS, TIR and WV imagery.
- (ii) Dvorak Technique directly measure wind and, pressure associated with TC intensity.
- (iii) Cloud Top Temperature is used to assess the height of the cloud.
- (iv) Polar satellites are useful in tracking thunderstorm events.
- (v) Very Thin Cirrus clouds are not observed in Visible imager

Q3 (I) Fill in the Blanks-(1 Mark)-Attempt any 4.

- (i) A network of _____ Nos Global Navigation Satellite System (GNSS) to derive Integrated Precipitable Water Vapor (IPWV) at the interval of 15minutes
- (ii) The radiance values and satellite derived wind of INSAT-3D are provided to _____ for its assimilation in NWP model.
- (iii) A dedicated _____ used to receive data directly from operational INSAT series of Geostationary satellites.
- (iv) INSAT -3D and INSAT-3DR satellite data are used in _____ / monitoring weather.
- (v) Satellite provides _____ surveillance of weather systems including severe weather events around the Indian region.

Q3 (J) True/False with suitable reason (2 Marks)- Attempt any 3.

- (i) Generation and dissemination of T-phi gram is possible at district level from Satellite data.
- (ii) All the processed Satellite images & products are archived on a regular basis.

Ozone & Air Pollution (Total Marks - 5)

Q6 Fill in the blanks: (1 mark each) - any 5.

- i. The highest levels of Ozone in the atmosphere are in the _____.
(Stratosphere/Troposphere)
 - ii. Ground level Ozone pollution is created near the Earth's surface by the action of _____ on precursors of Ozone. (Solar Radiation / Acidic Rain)
 - iii. Total columnar Ozone is measured by _____. (Skyradiometer / Brewer Spectrophotometer)
 - iv. Stratospheric Ozone absorbs _____ the part of solar radiation. (Infrared / UV)
 - v. _____ pollutants are directly emitted by air pollution sources in the atmosphere.
(Primary/Secondary)
 - vi. _____ may have warming or cooling effects, depending on their characteristics.
(Aerosols/GHGs).
 - vii. PM10 is the aerosol of size _____ than 10 micrometer diameter. (More/Less).
 - viii. 90 % of atmospheric Ozone is found in _____. (Stratosphere / Thermosphere).
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