

Exercises for On-Job-Training of Intermediate Met.Trg.Course

(Duration - 4 week)

| S. No. | Units / Division | Item | Marks | | | | | | | | | | | | | | | | |
|---------------|---------------------|---|---------------|-----------------|---------------|------------|----|---------------|--|--|----|-------------------|--|--|-----|---------------------|--|--|----|
| 1. | RWFC | <p>Q 1: Plot the Tephigram from given data and find out the following parameters. The formula sheet is enclosed for ready reference</p> <ol style="list-style-type: none"> i. Identify various lines of T-Φ gram. ii. Find the mixing ratio of different levels. iii. Determine the following parameters with their units and indices. <ol style="list-style-type: none"> a. LCL, CCL, LFC and Freezing Level. b. Potential Temperature, Equivalent Potential temperature, Convective Temperature, Equivalent Temperature, Wet Bulb Temperature, Wet Bulb Potential Temperature. c. Showalter Index(SI) d. K- index(KI) e. Cross Total Index f. Vertical Total Index g. Total Total Index(TTI) 4. Types of Instability (Determine whether atmosphere is Stable, Unstable or Conditionally stable) 5. Convective Temperature 6. Criteria for Thunder Storm over Delhi by using Critical Values and Actual Values. 7. Determine if Actual Values satisfy the Critical Values then conditions are favourable. <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Name of index</th> <th style="text-align: left;">critical values</th> <th style="text-align: left;">actual values</th> <th style="text-align: left;">conditions</th> </tr> </thead> <tbody> <tr> <td>SI</td> <td>Less than 2°C</td> <td></td> <td></td> </tr> <tr> <td>KI</td> <td>Greater than 24°C</td> <td></td> <td></td> </tr> <tr> <td>TTI</td> <td>Greater than 44.5°C</td> <td></td> <td></td> </tr> </tbody> </table> <p>Formula:</p> <p>SHOW: Showalter Index (SI) $SHOW = T_{500} - T_{Parcel}$ T_{500} = Temp. in Celsius at 500 mb T_{Parcel} = Temp. in Celsius at 500 mb of a parcel lifted from 850mb</p> <p>KINX: K- Index(KI) $KINK = (T_{850} - T_{500}) + TD_{850} - (T_{700} - TD_{700})$ T_{850} = Temp. in Celsius at 850 mb T_{500} = Temp. in Celsius at 500 mb TD_{850} =Dew point temp. in Celsius at 850 mb T_{700} = Temp. in Celsius at 700 mb TD_{700} =Dew point temp in Celsius at 700 mb</p> <p>CTOT: Cross Total Index $CTOT = TD_{850} - T_{500}$ TD_{850} =Dew point in Celsius at 850 mb T_{500} = Temp in Celsius at 500 mb</p> <p>VTOT: Vertical Total Index $VTOT = T_{850} - T_{500}$</p> | Name of index | critical values | actual values | conditions | SI | Less than 2°C | | | KI | Greater than 24°C | | | TTI | Greater than 44.5°C | | | 20 |
| Name of index | critical values | actual values | conditions | | | | | | | | | | | | | | | | |
| SI | Less than 2°C | | | | | | | | | | | | | | | | | | |
| KI | Greater than 24°C | | | | | | | | | | | | | | | | | | |
| TTI | Greater than 44.5°C | | | | | | | | | | | | | | | | | | |

| | | | |
|----|-----------|---|----|
| | | <p>T850 = Temp. in Celsius at 850 mb T500 = Temp. in Celsius at 500 mb TOTAL: Total Total Index (TTI) TOTL= (T850- T500) + (TD850 – T500) T850 = Temp. in Celsius at 850 mb TD850 =Dew point temp. in Celsius at 850 mb T500 =Temp. in Celsius at 500 mb</p> <p>Q. 2: Draw the isobars at the interval of 2 hpa and demarcate low pressure, high pressure area and Monsoon Trough on the given surface chart dated 07.09.2011 and 08.09.2011 (copy of chart enclosed)</p> <p>Q. 3: Draw the stream lines and demarcate centre of cyclonic/ anticyclonic circulation/COL region on the given upper air chart of 07.09.2011 and 08.09.2011(850 hpa, 700 hpa, 500 hpa and 200 hpa)(copy of chart enclosed)</p> <p>Q. 4 : On the basis of above surface and upper air charts describe the synoptic situation and prepare the inference for Delhi region and issue the weather forecast for next 24 hours.</p> <p>Q. 5 : Draw the isotherms at the interval of 2 degree celsius on the given Max/Min temperature charts dated 07.09.2011 &08.09.2011. On the basis of above charts and given Max/Min temperature departure charts dated 07.09.2011 & 08.09.2011 demarcate the heat wave and cold wave area, if any. (copy of chart enclosed)</p> <p>Note :- See Enclosure-I</p> | |
| 2. | NWFC | <ol style="list-style-type: none"> 1. Preparation and editing of bulletins and maps etc. 2. Operation of PWS system in synergie. 3. Monitoring, prediction and warning of cyclonic disturbances in cyclone module system in synergie. | 5 |
| 3. | NWP | <ol style="list-style-type: none"> 1. Overview of the High Power Computing System 2. Specification of NWP Models run at HPCS in NWP Division 3. Running of various NWP Models in HPCS 4. Derived meteorological parameters for analysis and forecast of weather system using GRADS 5. Preparation of inference from NWP forecast | 5 |
| 4. | Sat. Met. | <p>Question on satellite Meteorology(Application Part)</p> <p>Q-1 Write a satellite bulletin in coded format for imageries Given below: (copy of imagery enclosed)</p> <p>Q-2 Give true or false with reasons (in brief)</p> <ol style="list-style-type: none"> (a) Centres of the weather systems are more clearly defined in Visible imagery. (b) Convective (thunder) clouds can be easily detected CCT in VIS imagery. (c) In CDO pattern, centre lies in cloud free region. (d) White pixel in satellite imagery represents clear sky. (e) For movement assessment WV imagery is the best tool as it gives an idea of the environment in which the storm is embedded. (f) Polar orbiting Satellites are generally used for the monitoring of different severe weather system. | 20 |

- (g) Water VAPOUR winds (www,s) are generated on the basis of cloud present in the atmosphere.
- (h) C.I.No. is always lower than T.I.Number.
- (i) Eye in the cyclone is generally visible when cyclone Intensity is less than T 2.0
- (j) The albedo of fresh white snow is greater than large CB.
- (k) Enhanced IR imagery being used extensively to analyse intensity of tropical cyclones.
- (l) A central cold cover (CCC) appears in T3.5 or greater tropical cyclones or has persisted for more than 12 hrs in weaker system.
- (m) For developing cyclones : CI no is the same as final T number.
- (n) Dvorak has expressed his views that analysis of weak system (T less than 2.5) is more complex and more subjective.

Q.3 What are the basic principles for interpretation of satellite imageries.

Q.4 Identify the weather systems in the following imageries with brief justification.(copy of A, B ,C and D enclosed).

Choose the correct answer from the following options available,

- Q. 5 Geostationary Satellite orbit around earth at a height of
- i. 3000 km.
 - ii. 3600 m
 - iii. 3600 km
 - iv. 900 km

- Q.6 VISIBLE wavelengths (reflected solar radiation) is
- i. 0.55 – 0.75 um
 - ii. 10.5 – 12.5 um

- iii. 4.0 – 6.0 um
- iv. 12 – 16 um

- Q.7 Low clouds can be easily traced using:
- i. IR IMAGERY
 - ii. VIS IMAGERY
 - iii. WV IMAGERY
 - iv. ENHANCED IR

- Q.8 Thunderstorm can be easily detected using :
- i. IR Imagery
 - ii WV Imagery
 - iii VIS imagery

Q.9 Name the imagery which are generally used Dvorak technique for the estimation of T. No. of cyclones.

Q.10 Name the technique used for TC intensity estimation.

Q. 11 Recognize the pattern and intensity of the vortices given below with justification. (Copy a, b, and d enclosed)

Note :- See Enclosure-II

| | | | |
|----|----------|---|----|
| | | <p>(g) Water VAPOUR winds (www,s) are generated on the basis of cloud present in the atmosphere.</p> <p>(h) C.I.No. is always lower than T.I.Number.</p> <p>(i) Eye in the cyclone is generally visible when cyclone Intensity is less than T 2.0</p> <p>(j) The albedo of fresh white snow is greater than large CB.</p> <p>(k) Enhanced IR imagery being used extensively to analyse intensity of tropical cyclones.</p> <p>(l) A central cold cover (CCC) appears in T3.5 or greater tropical cyclones or has persisted for more than 12 hrs in weaker system.</p> <p>(m) For developing cyclones : CI no is the same as final T number.</p> <p>(n) Dvorak has expressed his views that analysis of weak system (T less than 2.5) is more complex and more subjective.</p> <p>Q.3 What are the basic principles for interpretation of satellite imageries.</p> <p>Q.4 Identify the weather systems in the following imageries with brief justification.(copy of A, B ,C and D enclosed).</p> <p>Choose the correct answer from the following options available,</p> <p>Q. 5 Geostationary Satellite orbit around earth at a height of</p> <ul style="list-style-type: none"> i. 3000 km. ii. 3600 m iii. 3600 km iv. 900 km <p>Q.6 VISIBLE wavelengths (reflected solar radiation) is</p> <ul style="list-style-type: none"> i. 0.55 – 0.75 um ii. 10.5 – 12.5 um <ul style="list-style-type: none"> iii. 4.0 – 6.0 um iv. 12 – 16 um <p>Q.7 Low clouds can be easily traced using:</p> <ul style="list-style-type: none"> i. IR IMAGERY ii. VIS IMAGERY iii. WV IMAGERY iv. ENHANCED IR <p>Q.8 Thunderstorm can be easily detected using :</p> <ul style="list-style-type: none"> i. IR Imagery ii WV Imagery iii VIS imagery <p>Q.9 Name the imagery which are generally used Dvorak technique for the estimation of T. No. of cyclones.</p> <p>Q.10 Name the technique used for TC intensity estimation.</p> <p>Q. 11 Recognize the pattern and intensity of the vortices given below with justification. (Copy a, b, and d enclosed)</p> <p>Note :- See Enclosure-II</p> | |
| 5. | Aviation | <p>1. What are main objectives of Aeronautical Meteorological programmes of WMO?</p> <p>2. What are the objectives of ICAO?</p> | 20 |

3. Describe about NWP System of IMD?
4. What type of Met activities are performed at AMS, AMO and MWO ?
5. What is RVR? How manual RVR is taken?
6. What are the methods for reporting RVR at airports?
7. What are the sensors used in DCWIS ? and what products are available in DCWIS ?
8. What is function of IAAWOS?
9. What are touchdown zone and threshold?
10. How various DWR Products e.g. Max Z, PPI, PPV, winds could top etc. Satellite Products-IR, Vis, MODIS in detection of CB clouds, low clouds, fog etc. are the useful tools for aviation forecasting.
11. How to monitor CB, squalls/squall lines and high rain spell using both DWR and Satellite-A with demo of 3-4 real cases which affected IGI Airport especially.
12. Prepare a flight forecast folder in T-3 & T-4 for the route VIDP-VEPT with the help of the following data:
FL: 100

TIME OF DEPARTURE: 0600 UTC ON 25.9.2011

| | | |
|--------|---------------------|-----|
| FL 140 | 320/15 BECMG 290/15 | +06 |
| FL100 | 320/15 BECMG 270/10 | +14 |
| FL070 | 320/20 BECMG 260/10 | +19 |
| FL050 | 320/20 BCEMG 260/10 | +24 |

CLOUDS:

LOWEST LAYER: SCTSC/CU AT 2500FT ISOLCB AT 2500FT
 HIGHER LAYER: BKNAC/AS AT 9000FT ISOLCB AT 33000FT
 SURFACE VISIBILITY: 4000M IN HZ BECMG 5000M IN HZ
 TEMPO 1500M IN TSRA

SIGNIFICANT WEATHER: ISOL TSRA

FREEZING LEVEL: 175

13. Prepare a flight folder using OLBS for a flight (VIDP-VABB), FI290, time of departure 25.9.2011 at 0900 UTC.
14. How flight man, MFI-synergy system and their analysis and products from DMDD system are useful in forecasting.
15. What are the basic requirements of issue of Trend forecast.
16. Append the Trend forecast in the Met Report with the following elements.
Present weather and Visibility – TSRA, 800M
Expected weather within next 2 hrs- +TSRA, Visibility- 600M
17. Decode the following TAF
TAF VIDP 070300Z 220600z 2309/2319 21006KT 5000 HZ NSC
BECMG 2313/2314 VRB02KT 3000 FU BECMG 2316/2317
2000 FU=
TAF VIDP 201500Z 2018/2124 04004KT 3000 HZ/FU NSC
BECMG 2023/2101 VRB02KT 1500 BR BECMG 2103/2105
33008KT 3000 HZ BECMG 2107/2109 32012KT 5000 HZ
BECMG 2113/2115 29006KT 3000 FU BECMG 2121/2123
VRB02KT 1500 BR=

| | | | |
|----|-----------------------|--|----|
| | | <p>Decode the following SIGMET warning VIDF SIGMET 08 VALID 091900/092300Z VIDP VIDF DELHI FIR FRQTS OBS AT 1530Z WI N3646 E07303 N 3244 E07917 N3239 E07209 TOP FL270 MOV SE05KT NC=</p> <p>18. Prepare a VVIP flight folder taking all necessary charts and inferences from IMD website.</p> <p>19. What is aircraft accident and incident?</p> <p>20. What is the responsibility of AMO/AMS concerned after occurrence of aircraft accident/incident?</p> <p>21. List the documents to be kept in custody after occurrence of aircraft accident/incident (Attachment –I and II) ?</p> <p>22. Find out the discrepancies in MET Reports, TAFs and Local forecasts as per Aviation Manual -2006.</p> <p>23. What are the methods of verification of forecasts- TAF, Trend, Take-Off-data, Local/Area forecast, SIGMET, Flight/Route forecast and their grading such as Satisfactory, Unsatisfactory, Good and Very Good, desirable accuracy as per ICAO.</p> | |
| 6. | AMSS | <p>1. What does A.F.T.N. stands for?</p> <p>2. What are W .M.O. headers of odd and even hours synops?</p> <p>3. What header will we use when no observation of P.B. is There?</p> <p>4. What does the V.P.N. stands for?</p> <p>5. What are the headers of the following aviation message? i. SPECI ii. METAR iii. LONG TAFOR iv. SHORT TAFOR</p> <p>6. When the W. M.O. header SXIN90 is used for synops?</p> <p>7. What are Admin message headers of the following stations? i. AMO PALAM ii. RTH NEW DELHI iii. MC Jaipur</p> <p>8. What are the types & speed of data communications at MSS PALAM?</p> <p>9. WHAT are the WMO headers of the following messages? i. TTAA part of temp. Data. ii. PPAA part of pilot data.</p> <p>10. What does A.M.S.S. stands for?</p> | 5 |
| 7. | Doppler Weather Radar | <p>Q.1. What is radar?</p> <p>Q.2. What is Doppler effect?</p> <p>Q.3. What is Doppler Weather Radar? How many types of Weather Radar are there?</p> <p>Q.4. How S-band radar (conventional) is different from S-band Weather Radar?</p> <p>Q.5. Give the overview of working principle of DWR?</p> <p>Q.6. Describe the following terms:</p> <ol style="list-style-type: none"> 1. Reflectivity factor(z), reflectivity(DBZ), Radial velocity(v), Spectrum width(w) 2. Volume scan 3. Scan strategy 4. Pulse repetition Frequency (PRF) 5. Pulse width 6. Peak and average transmitted powers 7. Attenuation 8. Cone of silence 9. Clutter correction | 15 |

| | | | |
|----|-----------------------------|--|---|
| | | <p>10. Phase shift, frequency shift 11. Maximum Unambiguous velocity 12. Velocity aliasing 13. Concept of range folding 14. Maximum Unambiguous velocity 15. Doppler Dilemma 16. Resolving of Doppler Dilemma.</p> <p>Q.7. What is attenuation? Q.8. Define the following (a) Max_Z product. (b) PPI product. (c) VVP product. (d) SRI product. (e) RAIN product. (f) RAIN-N product. (g) CAPPI product. (h) TOPs product. (i) BASE product. (j) VIL product. (j) WARN (HAIL & Microbrust) product. (k) Wind product. 9 (l) HMAX product.</p> <p>Q.21. What is the BEAM product and its use ? Q.22. Define the RAW product. Can it be displayed in image Form? 10 Q.23. Define the STAT product and what its use? 11 Q.24. Define the SHEAR product? 12 Q.25. Define the field application of following DWR products. 13 MAX_Z, Wind Shear(Radial, Azimuth, Elevation), Spectrum Width, WARN, SRI, VIL, PAC, Horizontal wind vectors, VVP2(Velocity Volume Processing), Raw Data in different format of different Task(IRIS greater than equal to NETCDF/HDF5/BUFR/Opera/ASCII/ etc.)</p> <p>Q.26 The image shown below is a radar display from a radar in clear-air mode. 14</p> <p>Note :- See enclosure-III</p> | |
| 8. | Inspection of observatories | <p>The participants will be able to know;</p> <p>(a) Inspection of observatory ie. 1. the purpose of inspection of observatory 2. the works carried out for inspection of observatory 2. comparison of barometers, thermometers</p> <p>(b) The exposure conditions of surface observatory 1. site selection of surface observatory 2. wind vane and anemometer 2. ordinary and self recording rainguage 3. Stevenson screen and thermometers 4. thermograph, hygrograph 4. visibility land marks</p> <p>(c) General maintenance of surface of instruments such as 1. wind vane and anemometer</p> | 5 |

| | | | |
|-----|---------|---|----|
| | | <p>2. ordinary and self recording rainguage</p> <p>3. thermometers and barometer</p> <p>4. thermograph, hygrograph, barograph</p> <p>(d) Preparation of inspection report</p> | |
| 9. | AWS | <p>1. General concept of AWS & ARG network & their preventive maintenance: The trainees will be shown the AWS station at H.Q. & they will be able to explain the following points:</p> <p>(i) The various factors which are to be taken into consideration for the selection of an AWS/ARG site.</p> <p>(ii) The various sub-units of an AWS/ARG system.</p> <p>(iii) The installation criteria for different sensors(AT/RH, Rainguage, WD/WS), Solar Panel & Antenna.</p> <p>(iv) The criteria & checking of the earthing of the AWS/ARG unit.</p> <p>(v) The checking of the data with standard sensors before commissioning of the AWS/ARG unit.</p> <p>(vi) How to do the preventive maintenance of the AWS/ARG unit.</p> <p>2. Comparison of AWS/ARG data with collocated surface observatories: The trainees will be able to explain the following points:</p> <p>(i) How to check the climatologically data stored in the AWs/ARG unit.</p> <p>(ii) The real time measurement of the AWS/ARG data for comparison with collocated surface observatory.</p> <p>(iii) The downloading of the data stored in the AWS/ARG unit.</p> | 5 |
| 10. | Library | Review of research paper | 20 |

Total marks : 100+20 = 120