

**INDIA METEOROLOGICAL  
DEPARTMENT  
QUESTION BANK  
OF  
INTEGRATED MET. TRAINING COURSE  
(IMTC)  
FINAL EXAMINATION  
BASED ON 1-11 BATCHES (2013-2021)  
PAPER-I: DYNAMIC METEOROLOGY  
AND NWP  
PART B : NWP**

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**PAPER –I : DYNAMIC METEOROLOGY AND NWP**

**PART B : Numerical Weather Prediction**

**1. Fill in the gap**

1. The horizontal and vertical resolution of IMD GFS model is ---- km ----levels.
2. Parameterisation used in NWP models to represent ----- process.
3. WRF model used for ----- forecast.
4. The nowcast product available from WDSSII model is .....
5. The operational Storm Surge models used in IMD are 1) \_\_\_\_\_ 2) \_\_\_\_\_ .
6. Use of nested domains in WRF model helps for \_\_\_\_\_ forecasts.
7. Linux machine allows \_\_\_\_\_ at the same time.
8. Problem of NWP is \_\_\_\_\_ problem.
9. Grid point data is prepared using \_\_\_\_\_ technique.
10. WRF model used for \_\_\_\_\_ forecast.
11. Present version of GFS in IMD is \_\_\_\_\_.
12. Vorticity & Divergence are \_\_\_\_\_ products from model.
13. Parameterisation used in NWP models to represent \_\_\_\_\_ process.
14. Objective analysis used in NWP models for-----
15. WRF is a ----- model
16. Forecasting weather at a place is ----- problem.
17. Horizontal boundary of a global model is-----.
18. Vertically integrated moisture flux & Shear tendency are **derived** products from model.
19. Problem of NWP is \_\_\_\_\_ problem.
20. Vertically integrated moisture flux & Shear tendency are \_\_\_\_\_ products from model.
21. RAMS is a \_\_\_\_\_ model.

22. Forecasting weather at a place is \_\_\_\_\_ problem.
23. Horizontal boundary of a global model is \_\_\_\_\_
24. \_\_\_\_\_ model takes care of forecast uncertainty
25. Lateral boundary of a Global model is \_\_\_\_\_.
26. Vertical development of weather system is not possible in a \_\_\_\_\_ model
27. NWP can give \_\_\_\_\_ specific forecast.
28. Vertical development of weather system is not possible in a \_\_\_\_\_ model.
29. NWP can give \_\_\_\_\_ specific forecast.
30. Two major indirect observations, important for NWP are ----- & -----
31. Any two important tasks completed in pre-processing part of an NWP system are -----  
& -----.
32. A regional NWP system obtains horizontal boundary conditions from-----
33. Preparation of input data for NWP is done in \_\_\_\_\_ part.
34. Method of Elimination of error from objectively analysed grid point is known as  
\_\_\_\_\_
35. IMD GFS is a \_\_\_\_\_ model.
36. Forecasting weather at a place is \_\_\_\_\_ problem.
37. Resolution of a Global model is in general \_\_\_\_\_ than that of a regional  
model.
38. NWP system can give ----- & ----- specific forecast.
39. Two major indirect observations, important for NWP are ----- & -----
40. IMD GFS is a ----- model & WRF is a ----- model.

**2. State with brief reason whether the statement is True or False**

1. In NWP model time integration  $\Delta t < \Delta x/c$
2. WRF model uses nested grid model.
3. Error arises due to inaccurate initial conditions
4. Vorticity /Divergence are direct products from model.
5. Human Interpretations are required in NWP models.
6. Inaccurate initial conditions do not lead to any error.
7. GFS model run in IMD is a non-hydrostatic model.

8. Surface AWS observations require quality control before assimilation.
9. Lateral boundary condition is required input for WRF model.
10. WDSS-II uses radar observation for nowcasting without any quality control.
11. Parameterization used in NWP models to represent physical process.
12. Initial & boundary fields do not require for regional models.
13. Virus can affect both Windows & LINUX machines.
14. Vertical velocity and Divergence are direct products from model.
15. Observation data can directly be ingested in a NWP model.
16. Resolution of a regional model is coarser than that of a global model.
17. Synoptic method of forecasting can give forecast at any point.
18. In EPS only one NWP model need to run with only one initial condition.
19. Observed data can directly be ingested into an NWP model.
20. For wall cloud region of an intense cyclonic vortex hydrostatic version of an NWP model is suitable. False
21. Elimination of error in the observed data is being done in the pre-processing part of an NWP model.
22. Moisture advection is a direct model output.
23. An EPS product with more spread is more reliable than that with less spread.
24. Direct model output is preferable than postprocessed model output for stake holders.
25. Hydrostatic version of NWP model is applicable for CB cloud development.
26. Observation data can't be ingested directly in an NWP model.
27. Gridded initial data for a NWP model is prepared in the post processing part.
28. Vorticity and temperature are all direct NWP products.
29. Post processing of NWP output is not required at all.
30. Hydrostatic version of NWP model is applicable for CB cloud development.

### **3. Answer the following questions**

1. What are the major steps in forecast process? Discuss any two process.
2. What are the conventional and non-conventional observations used in NWP models ?
3. What is the advantage of non-hydrostatic models ?
4. Discuss in brief MME based district level forecast of IMD.

5. What are the advantages and disadvantages of Regional Models.
6. Give two advantages and disadvantages of non-hydrostatic models.
7. Why human interpretation requires in NWP models
8. Define non-hydrostatic models. Discuss its merits and demerits.
9. What are models used in IMD ERFs for extended range forecast and what are the products available and at what time range.
10. Describe Real-time NWP Products.
11. What is physical parameterization in NWP model? Describe briefly the different types of physical parameterizations.
12. Write about the NWP products used for cyclone forecasting in IMD.
13. What are different types of observations used in data assimilation of IMD. Describe the function of CQC.
14. Write short note on storm surge model in IMD. Give any five points on advantage and disadvantage between Windows and LINUX based operation systems .
15. Write short note on storm surge model being operationally used in IMD.
16. Discuss, in brief, the major components of a typical NWP system.
17. Describe any 3 real-time NWP Products.
18. What are models used in IMD ERFs for extended range forecast and what are the products available and at what time range.
19. What are the broad major components of a NWP system, in general? Discuss any two processes.
20. What are the direct and derived NWP outputs? Discuss any two derived NWP products with their interpretations and applications?
21. Write down different broad components of an NWP model.
22. Write down mathematically an IVP for an arbitrary unknown variable  $(x,t)$
23. Draw a schematic diagram showing major components of an NWP system. Discuss in brief about input and model parts.
24. Discuss in brief about global and regional model.
25. Discuss in brief classification of NWP models.
26. Discuss in brief the merits and difficulties in NWP.
27. Mention different sources of observations required for NWP.

28. Discuss in brief about global and regional model.
29. Write down the expression for vorticity advection
30. Write one utility of the NWP product vertical shear of horizontal wind and its tendency.
31. Provide guidance to anticipate intensification of a Cyclonic storm. Greater value of vertical wind shear or its positive tendency are not favourable for intensification.
32. Provide guidance to anticipate intensification of strength of South west monsoon flow.