MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION
B.Sc (Hons.) Agriculture

Semester	:	VI (NEW)	Academic Year	:	2022-23
Course No.	:	ELE—AGM-361	Title	:	System Simulation and Agro- advisory.
Credits	:	3 (2+1)	Max. Marks	:	80

Model Answer

SECTION " A"

Q.1 Describe soil –atmosphere-continuum. Enlist and explain components of soil and nutrient balance.

Ans : "SPAC- is the pathway for water moving from soil through plants to atmosphere . Continuum is the continuous nature of water connection through the pathway .Low water potential of atmosphere and higher water potential of leaves leads to diffusion gradient across the stomatal pores of leaves drawing water out of the leaves. As water vapour . transpire out of the leaf water molecules evaporate off the surface of mesophyll cells to replace the lost molecules since water in the air inside leaves is maintained at saturation vapour pressure .

Movement of physical variables like heat, liquids, electricity can be described by a relation linking a flux and a driving force as below.

Flux= KX driving force . –ve sign of K indicates the flow is downhill .

components of soil and nutrient balance.

1. Minerals , organic matter water and air .Mineral nutrients are critical to health . vigour and productivity of plants
2. Organic matter store nutrients in the soil and important indicator of fertile soil..
3. Soil fertility is influenced by parent material . climate. Biota and topography.
4. Soil structure and texture have profound impact on water holding capacity. Nutrient retention and nutrient supply.

Q.2 Define model . Enlist and explain types of models.

Ans: Definition:- Model is an equation ors et of equations which represents the behavior of a system.

Types of models

1. Statistical empeerical models
2. Mechanistic models
3. Deterministic models
4. Stochastic models
5. Static models
6. Dynamic models

Q.3 Write in brief applications of modelling in agriculture. Describe elements responsible for crop growth.

Ans :- Applications of modelling in agriculture.

1. Seed rate to be used.
2. Row spacing or crop geometry.
3. Fertilizer dose and its application.
4. Irrigation and its stage of application.

Elements responsible for crop growth:-

1. Solar radiation.
2. Temperature.
3. Soil Temperature.
4. Atmospheric Pressure.
5. Wind.
6. Rainfall.
7. Evaporation.

Q.4. Describe verification and sensitivity analysis of elementary crop growth modele.

Ans : Definition of elementary crop growth models :- model is a schematic representation of the conception of a system or an act of mimicry or a set of equations which represents the behavior of a system at basic levels.
Elementary Crop growth model is a primary representation of an object , system or idea in some form other than that of entity itself.

verification and sensitivity analysis :-

1. verification means to test truthfulness of correctness of model or sets of model. Thus verification is used as evaluation for truthfulness or correctness while validation is used as evaluation of model for its usefulness. Verification involves the evaluation of the accuracy with which computer code represents the model.

sensitivity analysis :-

It is done to explore the behavior of the models for different values of the parameters as input . the model is said to be sensitive to input parameters e.g. weather variable, fertilizer etc.

Q.5 Define weather forecasting. Give classification of weather forecasting.

Ans :- Definition: The prediction of weather in advance is called as weather forecast . Weather forecasting is the prediction of weather.

Classification of weather forecasting:

1. Now casting :- Denotes very short range few hours to 24 hours .e.g. Forecast at the time of cricket match during the day.
2. Short range forecast (SRF) :-Valid for 3 days or 72 hours .and are issued twice a day.
3. Medium range forecast (MRF) Valid for 3 to 10 days period . In this forecast irregularities of weather elements such as temperature, rainfall from normal values are predicted. Agricultural operations like sowing , planting , spraying , dusting , irrigation scheduling , storing, fertilizer application, transportation of Agril. and live stock goods protection from frost , hails, can be forecasted .
4. Lon range forecast (LRF) :- Vali for period more than 10 days e.g. month, or a season

Q.6: Define potential and achievable crop production. Describe modelling techniques for potential and achievable crop production estimation.

Ans:

Potential crop production :- Is defined as the yield of a cultivar when grown in environments to which it is adapted , with nutrients and water non-limiting and with pests, diseases, weeds, lodging and other stresses effectively controlled.

Achievable crop production :- Is defined as the yield of cultivar when grown in environments to which it is limited by water, plant nutrients, weeds , diseases, pests and pollutants.

Modelling techniques for potential and achievable crop production :-

1. **Task analysis** – A task analysis techniques makes a model of the job that a user is expected to perform. Analysis techniques can be applied to those models in order to determine such fact how long it may take users to perform given tasks, or how much 'cognitive load' is placed on the user (where 'cognitive load' is broadly a measure of much information the user need to remember).
   The most researched task analysis technique is GOMS (goals, operations, methods and selection) developed by card et al (1983). The analysis describes : the users goals or things that user want to achieve, the operation or things the user can do, perhaps such things as thinking or looking or maybe selecting items from computer menus, typing or pointing with the mouse, the methods , which are sequences of operations that achieve goal, and selections , which describe how the users may choose between different methods for achieving the same goal. GOMS only really deals with the expert behavior though and takes no account of the user making errors.
2. **User modelling :-** whereas task analysis aims to model the jobs that users do, user modelling aims to capture the properties of users. User models can capture and predict properties such as the way the user constructs goals, how user makes plans to carry out those goals, the users ability to do several tasks at once, how the user manages perception, etc. Such models are based to a large extent on psychological theory, which in turns is based on empirical evidence.
   Typically the analyst builds a model of the interactive device that is intended to be built and then integrates this device model with an existing user model.
3. **Interactive device modelling :-** several techniques have taken existing software specifications and analysed them from the users point of view. In other words the analyst takes a model of the interactive device which is typically produced as part of the design process, and analyses it for usability properties. A lot of work went into proposing usability properties and then formalising mathematical equivalents of them. In this way software specifications could be mathematically analysed for usability in much the same way as they can be analysed for functional correctness. Dix's PIE model is a classic example of interactive device modelling. The device is modelled as a collection of states with allowable transitions between them.

Q. 7 Write down in detail effect of nutrient deficiencies on crop growth.

Ans: **Deficiency symptoms of different nutrients :-**

1) Nitrogen (N) – v-shaped yellowing , stunted growth, pale yellowish leaves
2) Phosphorus (P)- dark green leaves with purplish tip, stunted growth , improper seed formation, seed setting problem upward curling, chlorosis.
3) Potassium (K)- Yellowing and necrosis of plant, tip burn , scorching, disease incidence.
4) Sulphur (S) – yellowing of younger upper leaves, interveinal chlorosis, delayed maturity,
5) Calcium (Ca)- chlorotic white tip became brittle, improper root system.

6) Magnesium (Mg) – chlorosis, necrosis, upward leaf curling
7) Boron (B) – drying of growing tip
8) Copper (Cu) – chlorosis , leaf loses lusture.
9) Iron (Fe) – interveinal chlorosis, leaf drying from tip towards base.
10) Molybdenum (Mo)- translucent spot, yellow or brown chlorotic mottling

Q. 8 What is value added weather forecast. Describe ITK for weather forecast and its validity.

Ans: Value added weather forecast :- It is forecast given by state data center of IMD , this forecasting contains medium range weather forecast (5 days) . this forecast is prepared by many of mathematical models, operational MM-5, ETA and T-80 models of national center for medium range weather forecasting (NCMRWF) and from the MM-5 model operational at IMD New Delhi. And value addition i.e. it made more accurate with satellite data, GIS data , present weather condition and study of previous 30 years data

ITK for weather forecast and its validity:-

1) Visible spectrum around the sun and the moon – If the spectrum around the sun had a greater diameter than that around the moon they predicted rainfall after day or two day. If the spectrum around the sun has larger diameter then rainfall is assured
2) The visible spectrum of light around the sun or moon is hallo according to its distance from the sun or moon. If the distance is more then it is called the halo phenomenon which is caused by a layer of thin veil of cirrus clouds i.e. non rain bearing clouds. But if the distance is less, it is called corona phenomenon produced by dense clouds which may cause rainfall.
3) Cloud and wind direction – if there is an accumulation of cloud in the south-east direction in a a layered form accompanied by winds blowing from the southern direction then it is claimed that there will be rainfall within day or 2 days
4) Weather prediction through birds and other animals – a) On a hot summer day the cry of bird called 'Nialu' for water brings rainfall . b) During rainy season farmers observe the ' Matilari' birds (house shift) and they predict heavy rainfall if the birds fly high in the sky c) If the maina bird baths in the water indicated that there will nbe rainfall within one or rwo days d) A group of sparrows frolicking in the sand indicate that there will be rainfall that day or next day and if they are obsereved to be playing in water then it is believed that weather will be dry for some days to come .
5) If the (Ttihari) birds lays her eggs on the higher porton of field then heavy rainfall is predicted . but if eggs are laid in the lower portion of field then drought is predicted.

Q. 9: Define crop-weather-calender. Describe structure of crop weather calendar.

Ans: Definition of crop-weather-calender-
This is the pictorial form of chart containing different stages of crop, optimum and unfavourable water condition for different stages of crop. Crop weather calendar has three following parts

1. Bottom part
2. Middle part
3. Top part

Structure of crop weather calendar :-
Part 1- climatic normals : climatic normals for each center computed for total weekly rainfall (mm), no. Of rainy days , evaporation(mm), weekly maximum temp(^{0}c), **min temp**(^{0}c), mean temp, sunshine hours, solar radiation, max and min

relative humidity wind speed and wind direction arranged in standard meteorological week wise in the upper portion of crop weather calendar

Part II- Phenological observations and climatic normals for high yield of crops- collect the pictures of individuals stage of each crop and arrange in such a way that the stage wise figure should adjust to the week of start of that stage to end of stage wise climatic normals for high productivity of the crop in a location will be computed based on a simple procedure..

Part -III Climatic normal favourable for incidence of major pest- The crop weather pest and disease calendars comes as bottom part of calendar which contain the climatic normals required for major pest or diseases of the crop as well as susceptible crop phonological stages .

Q.10 Define remote sensing. Write down application of remote sensing in agriculture.

Ans: **Defination of remote sensing-** remote sensing is the science of making inferences about material objects from measurement made at a distance with out coming into physical contact with objects under study.

Applications of remote sensing

1. Crop production forecasting
2. Assessment of crop damage and crop progress
3. Horticulture cropping system analysis
4. Crop identification
5. Crop acreage estimation
6. Crop condition assessment and stress detection
7. Identification of planting and harvesting dates
8. Crop yield modelling and estimation
9. Identification of pest and disease estimation.

" SECTION B "

Q. 11 Do as directed .

1. Give the formula for water uptake
2. What is mean by albido?
3. Give one example for ITK
4. Give the long form of IMD
5. Give the formula for flux
6. Give the long form of MSL
7. Give two deficiency symptoms of nitrogen
8. Give example of now casting

Ans:

1. Water uptake= $\frac{\text{Water potential in soil – water potential at root surface}}{\text{Soil resistance}}$
2. Reflacted solar radiation
3. Visible spectrum around sun and the moon
4. IMD= Indian Meterological Department

5. Flux= Driving force

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6. MSL= Mean Sea Level
7. a)Yellowing of leaves
   b)Stunted growth
8. Few hours to 24 hours

Q. 12 Fill in the blanks.

1. Loss of water in the form of vapour from plant canopy is known as **Transpiration.**
2. **Statistical** models express the relationship between yield and yield components and weather parameters.
3. **Static** model do not take into account time factor.
4. Longitude and latitude are constituents of **Site** data.
5. Medium range forecast is valid for **3-10** days period.
6. IMD is located at **Pune.**
7. Visible spectrum around the sun and moon is the example of **ITK** for weather prediction .
8. **Middle**Part of crop weather calendar provide information related to phonological stages of the crop.

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MARKING SCHEME

Semester: V1 (NEW) Academic Year : 2022-23

Title : System Simulation and Agro- advisory

Q. No.	Particulars	Marks
1	Description -- 4 marks, Explainatio –4 marks	8
.2	Definition---- 2 marks, Types of models—6 marks.	8
3	Applications of modeling -- 4 marks , Elements of crop growth – 4 marks.	8
4	Verification and Sensitivity analysis of Elementarycrop growth models.- 8 marks	8
5	Definition -- 2 mark, Types – 6 marks.	8
6	Definition -- 2 marks Modeling techniques – 6 marks.	8
7	Effect of nutrient defeciencies- 8	8
8	Value added weather forecast-- 4 ITK-4 marks.	8
9	Definition -- 2 mark, Descriptio– 6 marks.	8
10	. Definition -- 2 marks, Applications– 6 marks	8
11	One mark for each bit	8
12	One mark for each bit	8

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