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BY-SAURBH KUMAR PANDEY

- Theory
- Explanation
- Derivation
- Example
- Shortcuts
- Previous Years Question With Solution

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Current Affairs

02/01/24

lecture-(1)

no. of hours → (25-30)

9311293803

→ Materials

→ Class notes ✓

→ Test series ✓

→ Question bank by saurabh pandey ✓

no. of questions

15-20

Topics to be covered under current affairs

→ Economics related current Affairs

→ Environment related current Affairs

→ Science and technology developments.

→ Polity / Political developments.

→ Awards and honors.

→ India and international affairs

→ International affairs

→ Sports related current developments

→ Art and culture, Heritage etc.

→ Miscellaneous section.

→ Government programs and policies

→ Defence exercises and defence related issues.

Economics related current developments

① Concept of Monetary & Fiscal Policy

Monetary policy : Policies related to the money supply in the indian market.

→ It is managed by RBI (Reserve bank of India).
RBI is central bank of India
RBI is also called as Banker's bank.

→ The main purpose of RBI is to control the rate of inflation in indian economy

→ There are tools used by RBI to control inflation and these tools are called as monetary policy.

→ Imp. concept

① When there is more money in the market, there is inflationary tendency in the market. (Demand ↑)

② When there is less money in the market, there is deflationary tendency. (Demand ↓)

③ When Inflationary → Bring down the inflation.
↓
RBI applies 'contractionary policies'

④ When Deflationary → RBI brings up the inflation
↓
RBI applies 'Expansionary policies'

→ In contrationary policy, money from the market is taken out.

→ In expansionary policy, money is infused into the market.

Monetary policy tools

① Repo rate : This is the rate of interest at which RBI gives loan to commercial banks.

② Reverse reporate : This is the rate of interest at which commercial banks give loan to RBI.

③ Open market operations (OMO) : This is the purchase and sale T-bills (Treasury-bills) and govt. securities by RBI is called as open market operations.

Note: **T-Bills (Treasury Bills) :-** T-bills are the instruments used by govt. of india to guarrantee repayment (or) funds at a later date.

→ T-Bills are used to meet the short term requirements of the govt.

→ T-Bills are used to meet the short term fiscal deficit of the country

→ **Fiscal deficit**: When there is more expenditure than the income, it is called as Fiscal Deficit.

→ T-Bills are issued for a maximum tenure of 364 days.

Government securities :- Whenever there is fiscal deficit, then the govt. issues govt. securities (G-Sec). G-Sec serves as a means for the govt. to sage funds from the public to meet its expenditure needs.
For this govt. issues G-sec (or) govt. securities.
Treasury bills are a type of short-term govt. securities.
While dated securities are long term borrowing by the govt.

④ **CRR (Cash Reserve Ratio)** :- Every commercial bank must have to maintain some liquid cash amount. This is percentage of
This liquid cash amount is the percentage of total time and demand liability.

inflation ↑ → CRR ↑

∴ CRR ↑ → Contractionary policy
CRR ↓ → Expansionary policy.
Inflationary

Saving a/c dep :→ demand liability
fixed dep. a/c → Time liability

Q. Contractionary or expansionary ?
→ Inflationary

1. Repo ↑ ——————→ Contractionary
2. Reverse repo rate ↑ → ~~Expansionary~~ Contractionary
3. T. bills purchase by RBI → Contractionary
4. G.sec sell by RBI → Contractionary

Fiscal Policy

Fiscal policy is the policy used by the govt. of India through finance ministry. and these policies are related to taxation.

Fiscal policy are also called as govt. revenue collection policy.

objectives of Fiscal policy

(i) To control Fiscal deficit
(ii) To boost economic growth.
(iii) To create employment opportunities.

Tools of Fiscal policy includes :-

① Taxation
② Govt. spending

Taxation

Whenever govt. increases the taxation then there may be more revenue collection by the govt. but people will have less money to spend and therefore there will be reduced economic growth in the country.

Taxation ↑ → economic growth ↓

but when there is less taxation by the govt. then there will be more money in the hands of people to spend and this will lead to more economic growth but at the same time govt. will have less money to spend leading to increase in fiscal deficit.

Taxation ↓ → fiscal deficit ↑

Govt spending

Govt. spending are of 2 types—

① Burden ⇒ It is related to the salary payment, subsidies expenditure etc.

→ revenue expenditure is that expenditure of govt. that has to be carried out on a regular basis by the govt. It is also not forming any income in the long run.

Capital expenditure

This is another type of expenditure by the govt. in which formation of infrastructure is included. Infrastructure formation means buiding of dam, roadways, expressways and ports, airports etc.

Capital expenditure is considered as good for the country because It is related to long term capital formation. Such type of govt. expenditure is encouraged.

If govt. spending increases revenue expenditure then it leads to non-formation of long term assets for the country and very the govt. will fall into fiscal deficit.

e.g. on this basis only, old pension scheme (OPS) was opposed.

But if the capital expenditure by the govt. is more then it leads to long term capital formation and ultimately long term benefit. so therefore long term capital formation i.e capital expenditure by the govt. is good for the country and it is also considered as positive expenditure.

Concept of Inflation

Inflation is the rate of change of prices of good and services.

When there is high rate of inflation then many people can not purchase the goods and services they need while if the inflation is very low then it affects the growth of the country. Therefore there must be a balance in the inflation rate of the country

→ Inflation of 3-5% is considered as good for the country.

How to measure the inflation?

There are two ways to measure inflation.

① WPI : Wholesale price index

② CPI : Consumer price index

→ WPI is calculated on the basis of change in the prices of goods and services in the wholesale market.

→ WPI is published by the office of economic advisor, ministry of commerce and industry.

→ WPI is calculated on the basis of base year prices of goods and services.

→ Base year is the previous year in which there has not been much changes in the price of goods and services also the current base year is 2011-12.

→ The WPI is calculated on the basis of the prices of good and services in WPI in the base year.
It is calculated on the basis of the basket of goods and services.

CPI

→ This is the price of goods and services that the end consumer pays.

→ CPI is also calculated through the basket of goods and services that includes food, medical care, education, electronic products, housing, clothing etc.

→ CPI is also measured using the difference in prices of goods and services in a base year wrt to good and services in current year in terms of percentage.

→ base years of CPI is 2012.

31/08/2023

Engineering Drawing, Design and Safety

Syllabus:

(30 hrs)

I) Engineering Drawing

1. Introduction to engineering drawing
2. Scales
3. Conic section
4. Engg. curves
5. Theory of projection
6. Projection of points
7. Projection of lines
8. Projection of planes
9. Projection of solids
10. Section of solids
11. Development of surfaces

II) General principles of design

III) Safety

i. Work study and ergonomics
ii. Fire safety
iii. Safety in industries

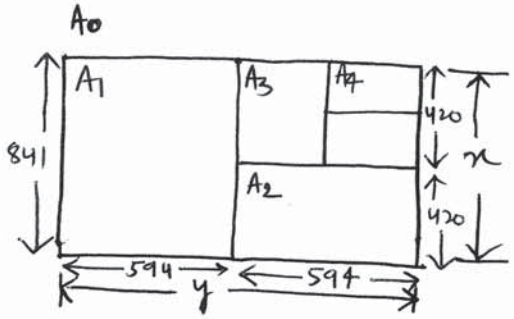
Engineering Drawing

Chapter-1 Introduction to Engg. drawing

I) Drawing sheet [IS 10711 : 2001]

BIS → Bureau of Indian Standard

Sheet size : $A_0 > A_1 > A_2 > A_3 > A_4$



A_0 Sheet size

Condition: $x : y = 1 : \sqrt{2}$

$$xy = 1\ m^2$$

on solving we get

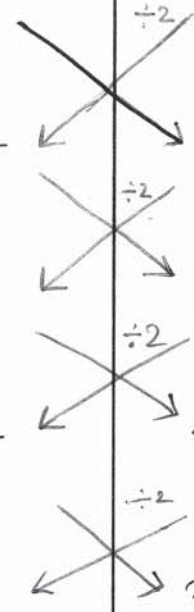
$$x = 0.841\,m = 841\,mm$$
$$y = 1.189\,m = 1189\,mm$$

- Successive sheet size is found by taking half of the longest length of previous sheet size and maintaining the ratio $1 : \sqrt{2}$.

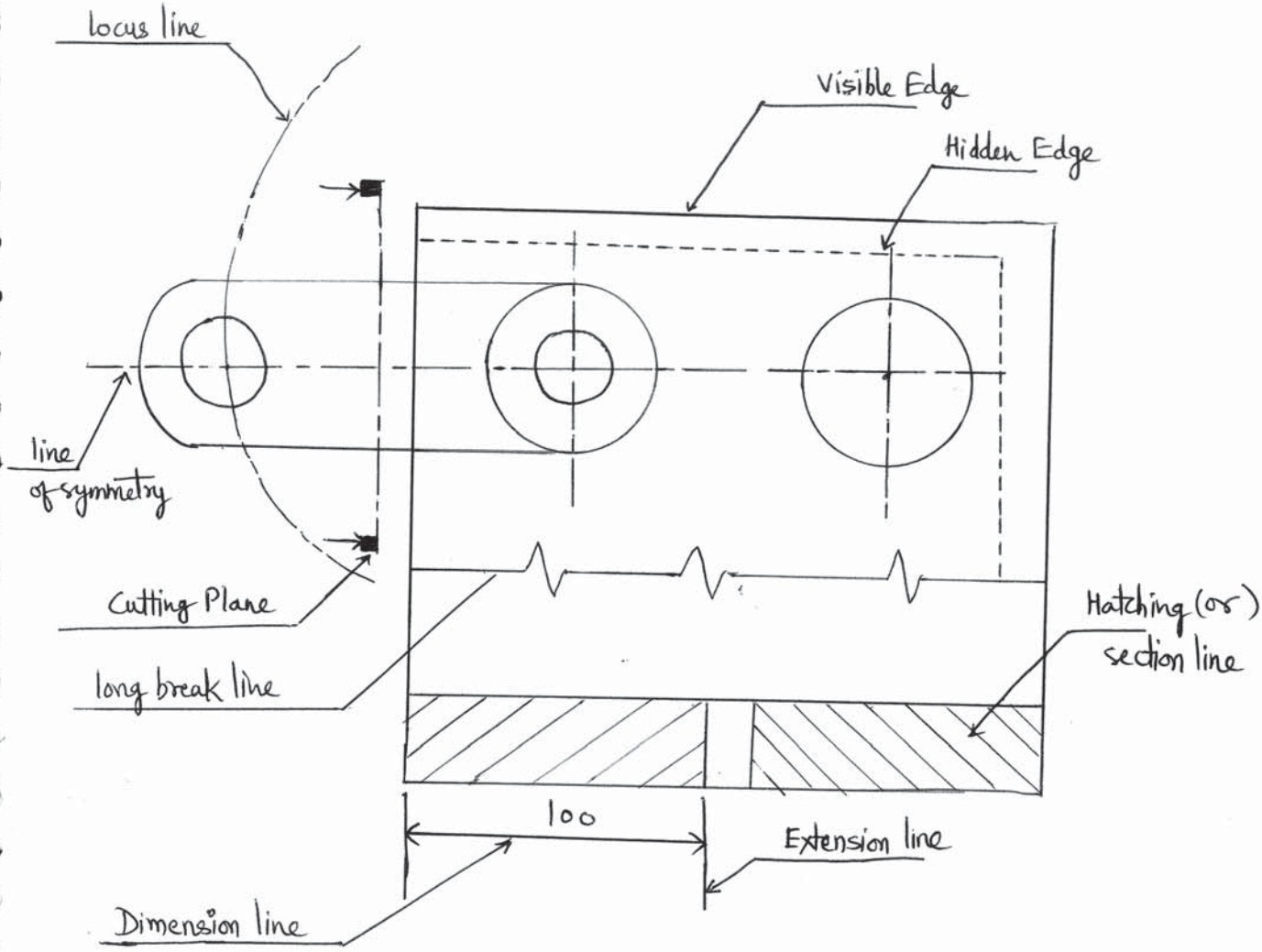
Reason for $1 : \sqrt{2}$ Ratio

Printers, scanners, photocopy machines are designed in the ratio of $1 : \sqrt{2}$.

Sheet size	x	y	$x : y$	Area $(m^2) = \frac{1}{2^n}$
A_0	841	1189	$1 : \sqrt{2}$	$1 = \frac{1}{2^0}$
A_1	594	841	$1 : \sqrt{2}$	$\frac{1}{2} = \frac{1}{2^1}$
A_2	420	594	$1 : \sqrt{2}$	$\frac{1}{4} = \frac{1}{2^2}$
Classroom A_3	297	420	$1 : \sqrt{2}$	$\frac{1}{8} = \frac{1}{2^3}$
A_4	210	297	$1 : \sqrt{2}$	$\frac{1}{16} = \frac{1}{2^4}$



II) lines (IS 10714: 2001]



Note:

(i) I) Continuous narrow line : Dimension line, Extension line, Hatching line and leader line (——↘)

II) Continuous wide line : Visible edge / visible outline

III) Dashed narrow line : Hidden edge

IV) long dash dotted line : Cutting plane, line of symmetry, centre line.

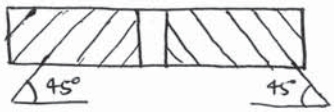
V) long dash double line (or) Phantom line : locus line.

VI) Continuous narrow line with zig-zag : long break line (ESE 2022)

(ii) leader line () is used to refer outline, dimension value (or) feature of an object.

(iii). Hatching line (or) sectioning line of adjacent part of an object is drawn in opposite direction preferably at 45°.

Ex:



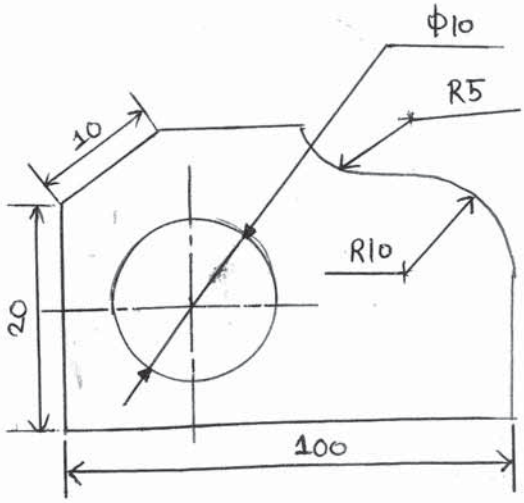
(iv) Priority of lines in case of overlapping

① Visible line
② Hidden line
③ Cutting plane
④ Centre line (or) line of symmetry
⑤ Projection line

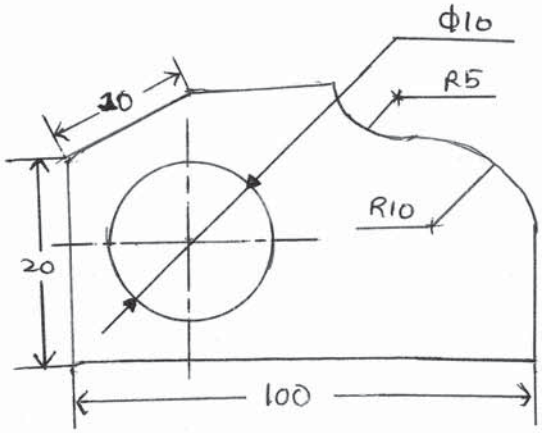
III). Dimensioning (IS 11669 : 1986)

- Method of dimensioning

Aligned method



Unidirectional Method



Standards & Quality

lecture ①

Standards and Quality practices in production, construction, maintainence & services

- → Maintenance
- → Sampling
- → Quality
- → Quality control tool
- → Process capability
- → Six sigma
- → TQM
- → ISO
- → Quality in service sector
- → Quality in construction
- → Inventory
- → line balancing
- → L.P.P.

} Industrial Engineering (ME (Tech))

Maintenance

Reliability: The reliability of a product or system can be defined as the probability that the product will perform its required function under specific condition for a certain period of time.

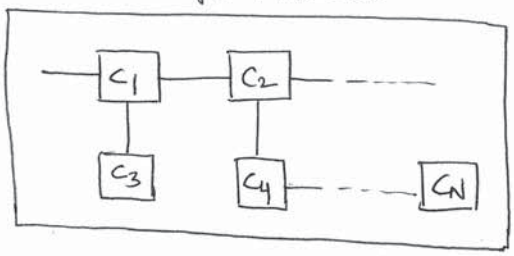
$$R = f(\text{time})$$

at $t = 0 \Rightarrow R = 100\%$

$t \uparrow \Rightarrow$ Reliability $\downarrow$

Note: Reliability is ~~used to~~ measure of quality of product over long run.

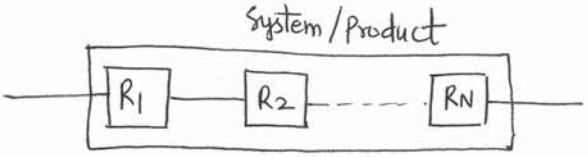
Now,



c = component

" Reliability of system will depend upon the reliability of individual component."

For series connection,



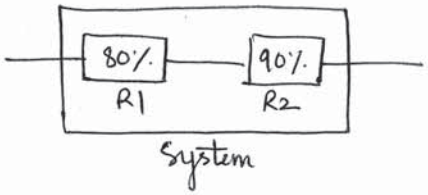
$$R_S = R_1 \times R_2 \times \dots \times R_N$$

Reliability
efficiency
Performance

R_S = Reliability of system
R_1 = Reliability of component — ①
R_2 = " " " — ②
R_n = " " " — ④

Q. Assume that a product has 2 component. Both of which must work for the product to function. Component 1 has reliability of 80% and component 2 has reliability of 90%. Compute the reliability of the system.

Soln:



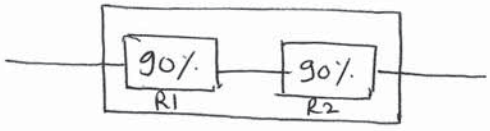
$$R_T = R_1 \times R_2$$
$$= 0.8 \times 0.9$$
$$= 0.72$$
$$= 72\%$$

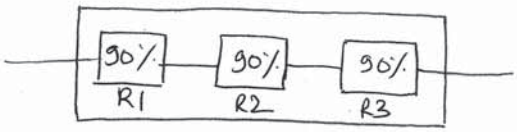
Statement ①: The reliability of the system is always less than (or) equal to the reliability of individual component when they are connected in series.

$$R_S \leq \{R_1, R_2, \dots, R_n\}$$

for equal:
① When all the component have 100% reliability.
② When there is a single component.

Q. Compute the reliability of system.





Soln:

$$R_S = R_1 \times R_2$$
$$= 0.9 \times 0.9$$
$$= 0.81$$
$$= 81\%$$

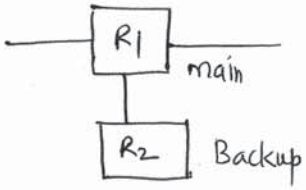
$$R_S = 0.9 \times 0.9 \times 0.9$$
$$= 0.729$$
$$= 72.9\%$$

Statement ②: As the no. of component in the series increases the reliability of the system will decrease.

How to increase the reliability of system –

Parallel Connection

critical component

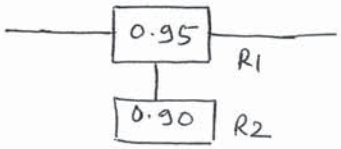


$$R_S = R_1 + R_2(1 - R_1)$$

R_S = Reliability of system
R_1 = Reliability of component – ①
R_2 = " " " – ②

Q. Two power generator provide electricity to a facility i.e main and back up generator. The main generator has reliability of 0.95 and back up has the reliability of 0.9. What is the reliability of the system.

Soln:



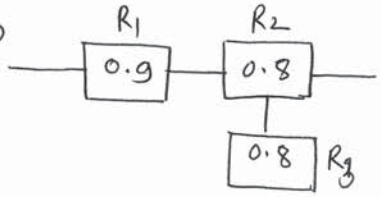
$$R_S = R_1 + R_2(1 - R_1)$$
$$= 0.95 + 0.90(1 - 0.95)$$
$$= 0.995$$
$$= 99.5\%$$

Statement-③: The reliability of system is always greater than or equal to the reliability of individual component when they are connected in parallel.

$$R_S \geq \{R_1, R_2, \ldots, R_n\}$$

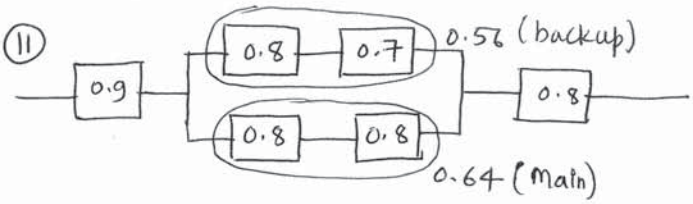
Statement ④: As the no. of component in the parallel increases, the reliability of the system will increase.

Q ①



$$R_S = R_1 \times \{R_2 + R_3(1-R_2)\}$$
$$= 0.9 \times [0.8 + 0.8(1-0.8)]$$
$$= 0.864 = 86.4\ \%$$

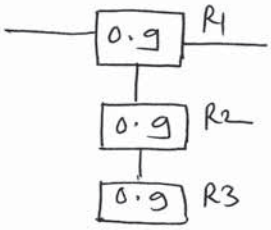
②



if we take 0.56 (main)
0.64 (backup)
answer will be same

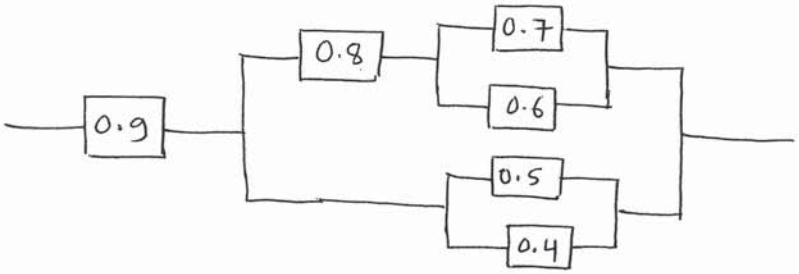
$$R_S = 0.9 \times [0.64 + 0.56(1-0.64)] \times 0.8$$
$$= 0.6059$$

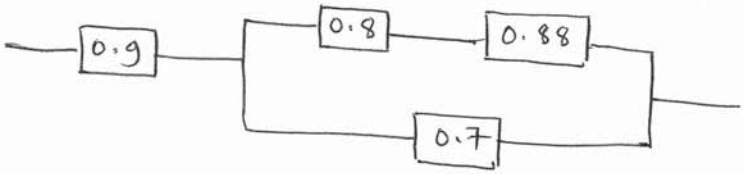
③

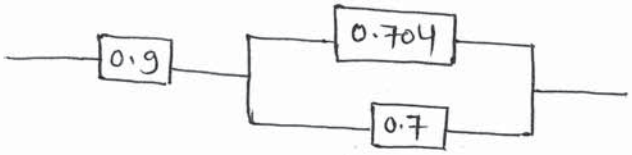


$$R_S = R_1 + R_2(1-R_1) + R_3(1-R_1)(1-R_2)$$
$$= 0.9 + 0.9(1-0.9) + 0.9(1-0.9)(1-0.9)$$
$$= 0.999$$
$$= 99.9\ \%$$

④







$$= 82.00\ \%$$

Reliability Prediction using exponential Distribution

It is one of the most commonly distribution in reliability prediction and it is used to predict the probability of survival to a particular time.

Normal Distribution
lognormal "
Gamma "
Weibull "
Exponential "

$R = f(\text{time})$

pdf $f(t) = \lambda e^{-\lambda t}$ (exponential distri.)

$\boxed{R(t) = 1 - F(t)}$

$$R(t) = 1 - \int_0^t f(t)\,dt$$

$$= 1 - \int_0^t \lambda e^{-\lambda t}\,dt$$

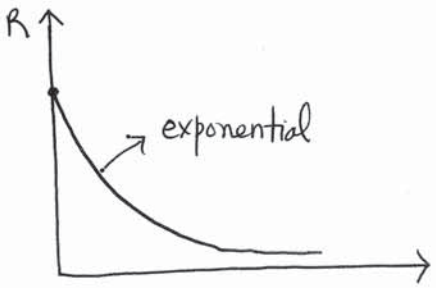
$\boxed{R(t) = e^{-\lambda t}}$

$F(t) \rightarrow$ CDF
$F(t) = \int f(t)\,dt$

$\boxed{R(t) = e^{-\lambda t}}$

t = time
R = Reliability
λ = failure rate

At $t = 0$,
$R = 100\%$.



Note:

Weibull ⇒ failure rate increases (or) decreases w.r.t. time
Exponential ⇒ failure rate remain constant w.r.t. time

For λ = ?

① MTTF → Mean time to failure
② MTBF → Mean time between failure
③ MTTR → Mean time to Repair

- **MTTF : Mean time to failure**

→ It referred as average time an item ~~may be expected~~ may be expected to function before failure.

→ It is used for non-repairable item.

e.g. bulb ④ → 3000 hr, 4000 hr, 5000 hr, 4000 hr

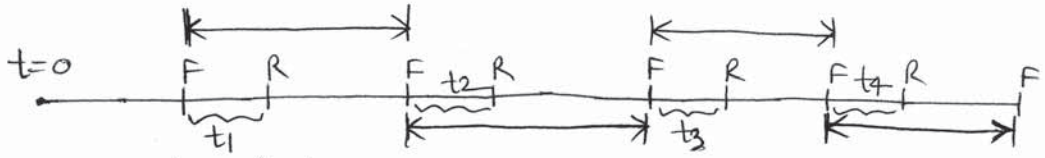
$$MTTF = \frac{3000 + 4000 + 5000 + 4000}{4} = 4000$$

- **MTBF : Mean time between failure**

→ It refers to time between two failure.

→ It is used for repairable item..

$$MTBF = \frac{\text{Total device hour}}{\text{No. of Repair}}$$



eg. Total device hour = 20,000

No. of Repair = 4

$$MTBF = \frac{20,000}{4} = 5000$$

- **MTTR : Mean time to Repair**

$$MTTR = \frac{t_1 + t_2 + \dots + t_i + \dots + t_n}{n}$$

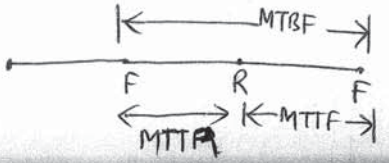
t_i = repair time for ith failure.

Q. (a) MTBF = MTTF − MTTR

~~(b)~~ MTBF = MTTF + MTTR

(c) MTBF = MTTF X MTTR

(d) MTTF = MTBF X MTTR



MTBF = MTTF + MTTR

If MTTR = 0 $\Rightarrow$ **MTBF = MTTF**

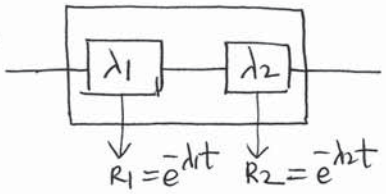
Note: MTBF can be used for both repairable and non-repairable item.

For λ

$\lambda = \frac{1}{MTTF}$ $\Rightarrow$ Non-repairable Items $\Rightarrow$ $R(t) = e^{-\frac{1}{MTTF}t}$

$\lambda = \frac{1}{MTBF}$ $\Rightarrow$ repairable Items $\Rightarrow$ $R(t) = e^{-\frac{1}{MTBF}t}$

ex:



$R_S = R_1 \times R_2$

$= e^{-\lambda_1 t} \times e^{-\lambda_2 t}$

$= e^{-(\lambda_1 + \lambda_2)t}$

Q. The reliability of a repairable product by exponential distribution is given in hour as

$$R(t) = e^{-0.004t}$$

and mean time to repair is 20 hr. The MTTF for the product in hr is –

a) 250 b) 230 c) 270 d) 150

Soln: $R(t) = e^{-0.004t} \Rightarrow R(t) = e^{-\frac{1}{MTBF}t}$

$0.004 = \frac{1}{MTBF} \Rightarrow$ **MTBF = 250**

$MTBF = MTTF + MTTR$

$250 = MTTF + 20$

MTTF = 230

5/12/23

Availability

It is the probability that a component (or) a system is performing its required function at a given point of time when it is used under the stated operating condition.

Maintainability

It is the probability that a failed component (or) system will be restored to a specific condition within a period of time when maintenance is performed according to the prescribed procedure.

$$\text{Availability} = \frac{MTBF}{MTBF + MTTR}$$

$$\boxed{A = \frac{MTBF}{MTBF + MTTR}}$$

A for non-repairable product → 0 or 1

$$\boxed{A = f(R, M, S)} \rightarrow \text{Supply effectiveness}$$

Availability, Reliability, Maintainability

$$\boxed{A = \frac{MTBF}{MTBF + MTTR + MTWS}}$$

MTWS = Mean time waiting supply

Q Suppose that a certain software product has mean time between failure of 10,000 hr and has mean time to repair of 20 hr. If the product is used by 100 customers. What is the availability.

(a) 80% (b) 90% (c) 98% (d) 99.8%.

Soln: $A = \frac{10,000}{10,000 + 20} = 99.8\%$

14/08/2023

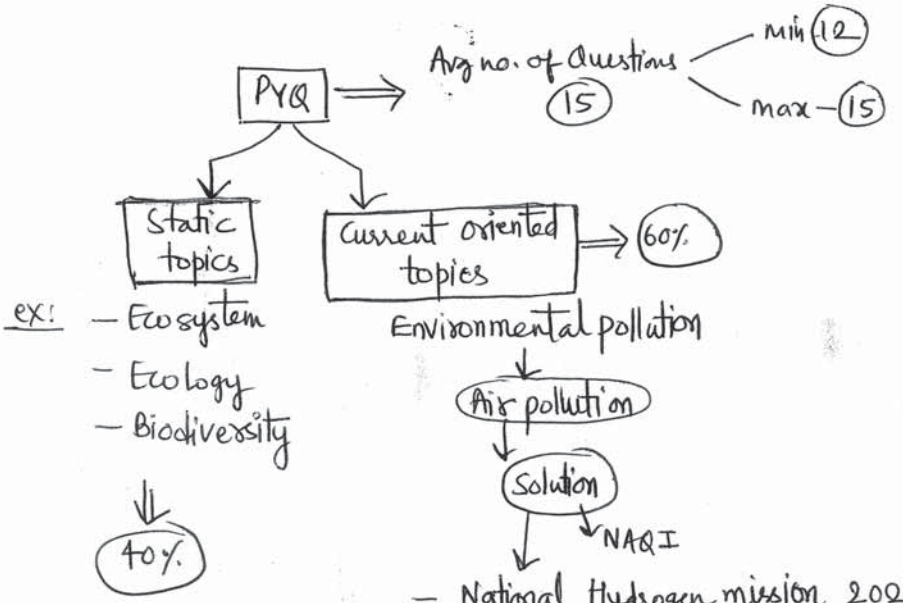
Environment, Ecology & Energy

Syllabus:

1) Basics of Environment
2) Biodiversity

Purely conventional

3) Environmental pollution & Environmental degradation.
4) Climate change & Global warming.
5) Protocols, conventions & Treaties related to environment.
6) International environmental conferences
7) Ozone hole
8) E.I.A. (Environmental Impact assessment)
9) Energy



Sources of study material

- Class Notes
- Printed Notebook
- Printed Workbook

(Given by made-easy)

- PYQ
- Current affair magazine

5 times revision is required to retain facts a concepts.

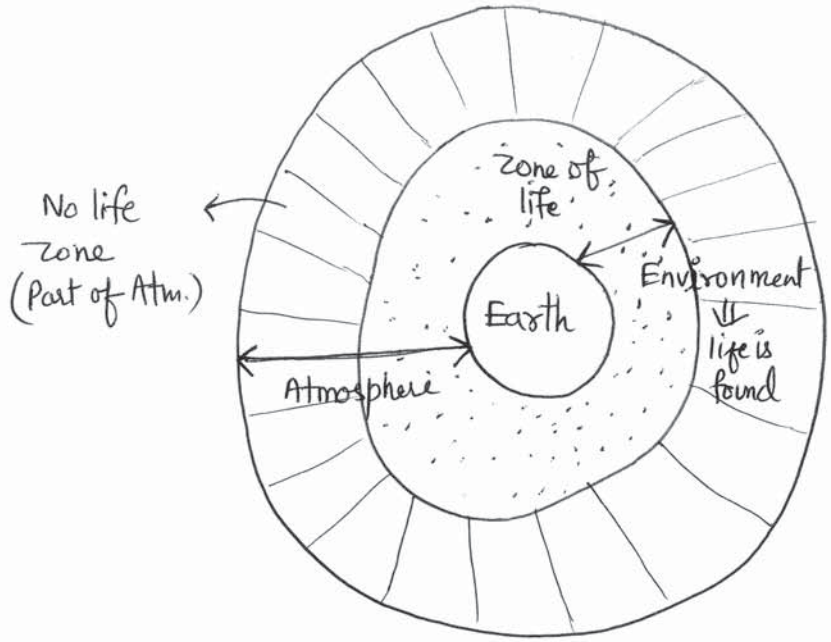
3 times → must

Vinay General studies portal – Telegram

98.9919 3917 – WhatsApp.

PYQ
+
Class Notes
+
Current Affairs

Chapter-1 Basics of Environment & Ecology

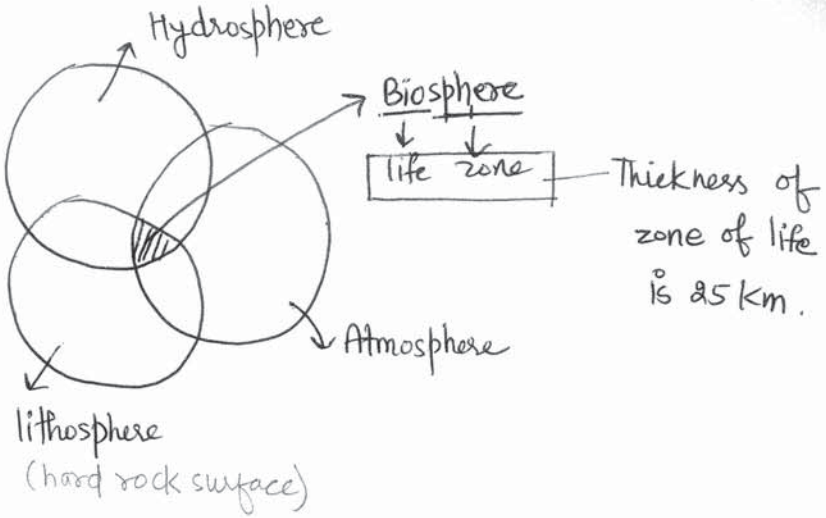


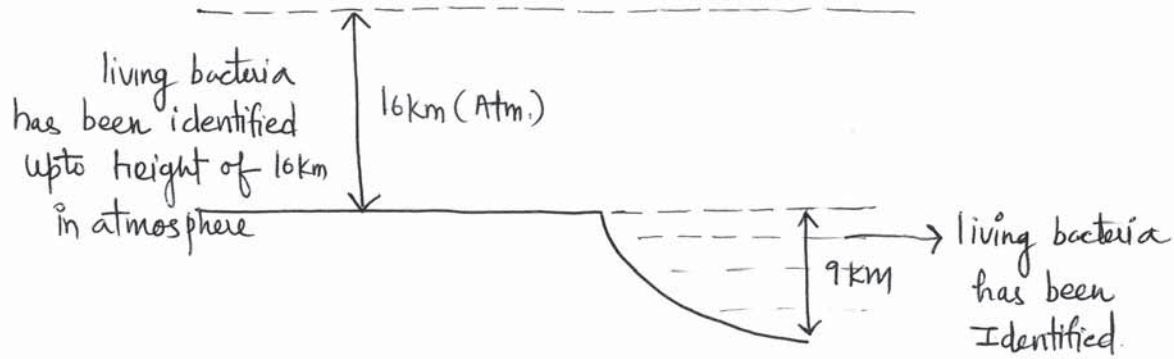
Atmosphere is sarrounding of earth which is made from gases, water vapour & dust particulates.

Environment is that surranding of earth where life is found and it is subset of atmosphere

Environment

The term Environment is made/derived from French word "Environ" which means to surround or surrounding of any thing. Therefore Environment is that surrounding of earth where life is found.





Components of Environment:

Ocean → 71% area
→ water has attained same level

- Biotic components (living beings)
  - flora → All plants/crops
  - fauna → All organisms
- Abiotic components (Non-living beings)
  - ex: Air, Water, Sunlight (heat energy), temperature (measure for heat energy) Soil etc.

Types of Environment

A] Natural Environment

Natural Environment refers growth & development of flora & fauna where they are allowed to develop without any human interference.

ex: Forest, Grassland etc.

B] Artifical Environment

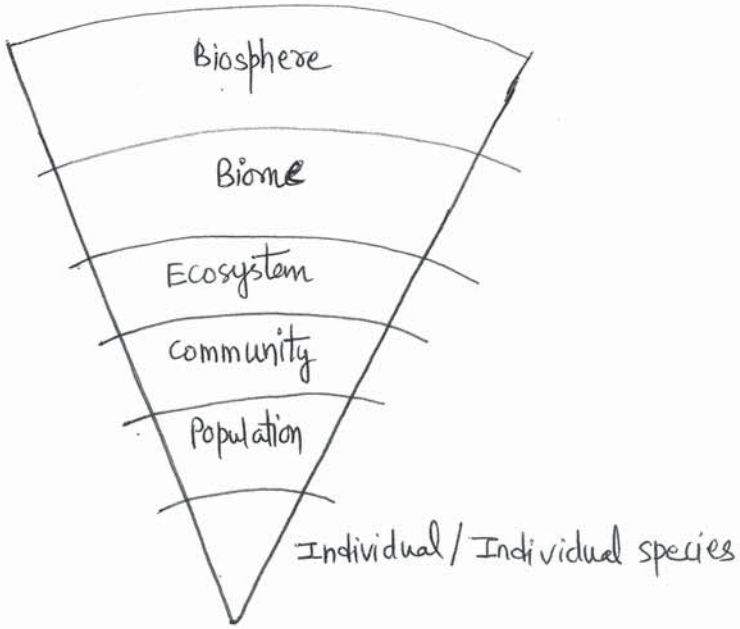
Artificial Environment refers those environment where growth & development of flora and fauna is designed to fulfil interest of human beings.

ex: Garden, zoo, aquarium etc.
Agriculture

Hierarchy in Environment

↓

Refers, levels at which life can be studied in Environment.
different



Individual / Individual species → living beings who look alike

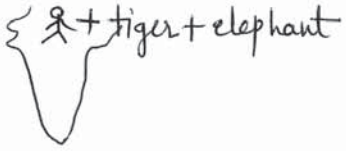
→ living being who can establish mating relationship and can produce fertile offsprings

ex (i) Horse + Mare → Horse/mare → fertile

(ii) Horse + Pony (diff. species) or Donkey → Mule → sterile

population ⇒ Sum of Individuals of <u>same species</u> who live in <u>same geographical area</u>.

Community ⇒ Sum of Individuals from <u>different species</u> who live in <u>same geographical area</u>.



Ecosystem ⇒ Sum of biotic and abiotic components

Biome ⇒ Sum of homogenous ecosystems

Biosphere ⇒ Zone of life

1. Project Scheduling
2. Capital Budgeting Technique
3. Project life cycle.
4. Project organization structure
5. Tenders and contracts

Project Management

lecture ①
16/07/2023

Project → It is a unique endeavor undertaken to create a product, service or result.

ANSI → American National Standard Institute

Project is a set of controlled and well coordinated activities undertaken within set of requirements and resources in order to accomplish a specified goal within specified schedule (time) & budget (cost).

Quality triangle

Successful project is one in which goal is achieved within specified time and cost / budget.

Recently 4th dimension of project is added.

↓

satisfaction of stakeholder.

Characteristics of project

① Project must be unique / It will be unique
② Cross-functional team & inter-disciplinary approach
③ Every project will have set of resource allocated (or) cost associated.
④ Start & finish dates
⑤ Specified Goal
⑥ Risky & full of uncertainities

9/11/23

Basics of Material Science

[Sumeet Tiwari Sir]

Introduction →

Material Science :→

↳ Material Science involve investigating the relationship that exist b/w the str. and properties of materials.

→ material Science does not deal with the strength & stiffness behaviour of engineering component s/a building, machines, Automobiles etc, rather it deals with the relationship b/w the structure and properties of materials with which these ~~structures~~ components are made of.

material →

→ material can be defined as something that consist of matter. It is the stuff by which something can be made

→ the engineering materials can be classified as -

1. metal & alloys
2. ceramic & glass
3. Organic polymers
4. Composite

Structure →

The structure of material usually relates to the arrangement of internal components s/a atoms, molecules, grains etc.

→ usually structures are classified as -

1. **Macro structure** :- "Examined with naked eye."

→ the internal symmetry of crystalline material may reflect in the external form of crystal.

s/a flat faces of diamond & etc.

② microstructure :→ It is observed with the help of an optical microscope.

③ Crystal Structure :→

→ It tells us about the atomic arrangement in the crystal.

→ the smallest group of atoms by repeating which periodically in all the dirn, the crystal structure can be developed. this smallest group of atoms is K/A unit cell.

④ Atomic Structure

↓

Electronic structure

↓

It tells us about the arrangement of $e^{\ominus}$ in various orbits of the atom.

Nuclear structure.

↓

It tells us about the no of protons & neutrons inside the nucleus of an atom.

→ It is studied by Nuclear electroscopic techniques S/A Nuclear magnetic Resonance & Mossbauer Studies etc.

Property →

↳ A property is a material trait in terms of the kind and magnitude of response to a specific imposed stimulus (excitation / Input).

→ Properties of solid material can be -

① mechanical property
② electrical "
③ Magnetic "
④ thermal "
⑤ optical "
⑥ deteriorative "

10/11/23

CH-01] Atomic Str and Chemical Bonding

→ matter ~~are~~ is made of very tiny particles called atoms which are indivisible structures

{ A → not
tomic → cuttable

→ Atoms can neither be created nor destroyed.

Subatomic particles

Electron	Proton	Neutron
→ -ve charged particle	→ (+ve)ly charged particle	→ neutral particle
→ Charge = -1.6×10^{-19} C	→ Charge = $+1.6\times10^{-19}$ C	→ Charge = 0
→ Mass = 9.1×10^{-31} kg	→ Mass = 1.67×10^{-27} kg (17 to 18 times Heavier)	→ mass = 1.67×10^{-27} kg.

Rutherfords atomic model →

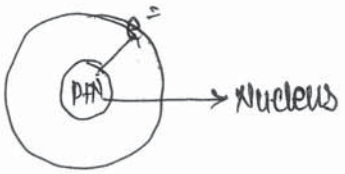
→ on the basis of famous α-particle scattering experiment, Rutherford proposed the nuclear model of atom.

→ Acc^{r} to this model the +ve charge and most of the mass is Concentrated in extremely small region, this very small [illegible] was called 'Nucleus'.

→ the nucleus is surrounded by $e^{\ominus}$ which move with a very high speed in a circular path called orbits

→ e^- & neutrons are held together by 'electrostatic forces of attraction'

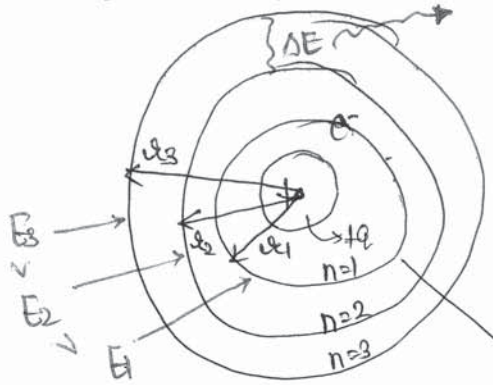
failed (क्योंकि ये नहीं बता पाया कि e⁻ nucleus में क्यों नहीं गिर रहा)



$$F = \frac{1}{4\pi\varepsilon_0}\frac{(+q)(-q)}{r^2}$$

→ coloumbic force of attraction (Electrostatic force)

Bohr's Atomic Model for Hydrogen atom →



$mvr = \frac{nh}{2\pi}$ ★ → e⁻ is moving only in those orbits where angular mom in integral multiple of $\frac{h}{2\pi}$

h = plank's Const

$h = 6.62 \times 10^{-34}$ J-S

Stationary states
↓
Allowed energy states.

$p = \frac{mv_0}{} = \frac{nh}{2\pi r_1}$

$K.E. = \frac{1}{2}mv^2 = \frac{p^2}{2m}$

$\Delta E \propto \nu$

$\Delta E = h\nu$ ★ → frequency.

(38)

Accᵒ to Bohr's model →

(i) the e⁻ in H-atom can move around the nucleus in a circular path of fixed Radius & Energy. these paths are called stationary states /orbits/ Allowed energy states

(ii) An e⁻ can move only in those orbits for which its angular momentum is integral multiple of $\frac{h}{2\pi}$.

i.e. why only certain fixed orbits are allowed

$mvr = \frac{nh}{2\pi}$

(iii) when an e⁻ jumps from an orbit of higher energy to another orbit of lower energy then energy is released in the form of radiations & vice versa.

the amount of energy released / Absobed is the difference of energy in two orbits.

$E_2 - E_1 = h\nu = \frac{hc}{\lambda}$

⇒ **Bohr's orbital radius →**

$$r_n = \frac{0.529 n^2}{Z} \text{ Å}$$

Z = atomic no. of elements

for hydrogen Z = 1 $\quad r_n = 0.529 n^2$ Å

⇒ **Energy of e⁻s in Bohr's orbit →**

$$E_n = \frac{-13.6 Z^2}{n^2} \text{ eV}$$

Z → atomic no of element

eV → electron volt

↓

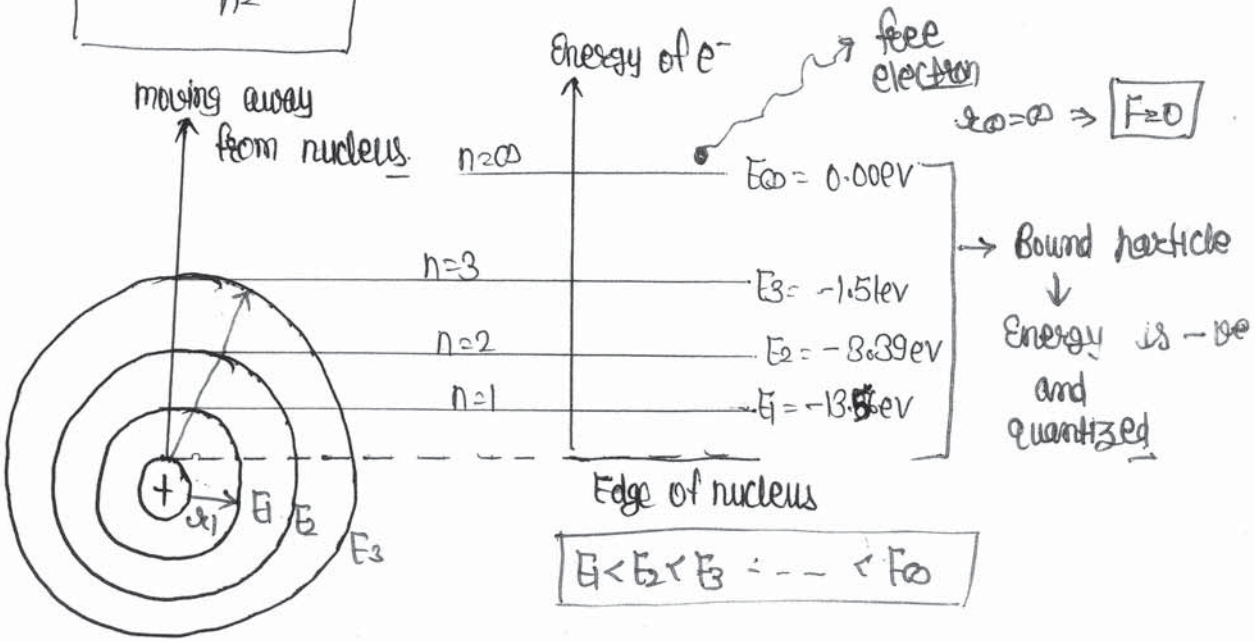
unit of energy

$1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$

for H atom

Z = 1 $\quad E_n = \frac{-13.6}{n^2}$ eV

(*)



(i) In any atom greater the dist of an e⁻ from the nucleus, higher is its total energy

(ii) An e⁻ orbiting very close to the nucleus in the first cell is tightly bound to the nucleus and posseses very small amount of energy

(iii) so it would be difficult to knock out this e⁻ from its orbit.

→ On the other hand an e⁻ orbiting far from the nucleus is loosely bound to the nucleus & posses greater amount of energy

this is the reason why valence e^- participate in chemical rxn & chemical bonding etc.

Que. the radius of first bohr orbit of e^- in H-atom is 0.529 A^0 what is the radius of second Bohr orbit in singly ionized atom? Helium

Soln a) 1.058 A^0 c) 0.264 A^0

b) 10.58 A^0 d) 0.0264 A^0

Soln

$$r_n = \frac{0.529\, n^2}{Z}\ A^0$$

$Z=2$, $n=2$

$$r_n = \frac{0.529 \times 4}{2} = 1.058\ A^0$$

$\Rightarrow$

wave Particle duality →

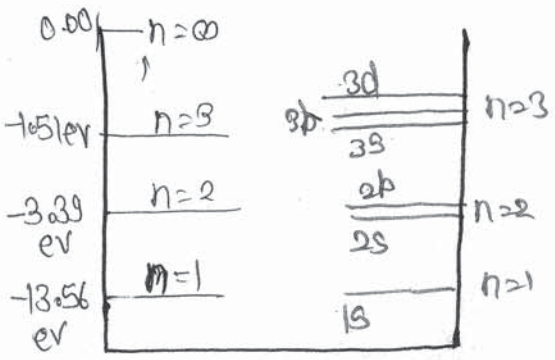
Acc to de-Broglie → Based on wave particle duality **Louis de Broglie** proposed that particles of matter e.g. e^- could exhibit a wave character in certain experiments.

→ de Broglie proposed that a particle of momentum p has a wavelength given by

$$\lambda = \frac{h}{p} = \frac{h}{mv}$$

h → planks Const
p → momentum
m → mass of particle
v → velocity " "
λ → de broglie wavelength

wave mechanical model →



→ In this model the e^- is considered to exhibit both wave like & particle like characteristics.

↳ with this model an e^- is no longer treated as a particle moving in a discrete orbital, rather position is considered to be probability of an e⁻s being at various locations around the nucleus.

↳ In other words position of an e^- is described by a probability distribution or e^- cloud.

⇒ the position of an e^- in wave mechanical model is described by four parameter called **Quantum no's**

→* the size, shape and spatial orientation of an e⁻s probability density are specified by 3 of these quantum no's –

(1) First Quantum No (n):-

→ It is also K/A Principle quantum no.

→ n = 1, 2, 3, 4 ———

→ It represents shells (orbits) (K, L, M, N ————)

→ this quantum no represents the **distance** of e⁻s from the nucleus, or its **position**.

→ this quantum no is related to Bohr's model.

(2) Second quantum no. (l) → (Angular / Azimuthal quantum no.)

↳ It signifies subshells - s, p, d, f :

→ it is related to the **shape of e^- subshell.**

→ the no. of these subshells are restricted by the magnitude of n.

i.e. $\boxed{l = 0 \text{ to } (n-1)}$

n = 1 → l = 0 ⇒ s - subshell

n = 2 → l = 0, 1 ⇒ s, p, subshells

n = 3 → l = 0, 1, 2 ⇒ s, p, d - subshells

③ third quantum no. → (m_l): (magnetic quantum no.)

↳ the no. of energy states for each subshell is determined by third quantum no.

⇒ * there are (2l+1) of m_l ranging from $-l$ to l.

s → 1 energy state

p → 3 energy states

d → 5 energy states

f → 7 energy states

→ In the absence of an external magnetic field the states within each subshell is identical.
However when a magnetic field is applied these subshell states split, each states assuming slightly diff energy

④ fourth quantum no → (spin quantum no.) (m_s) :-

→ Associated with each e^- is a spin moment which must be oriented either A.C.W or C.W.

↳ related to this spin moment is the fourth quantum no for which two values are possible $+\frac{1}{2}$ & $-\frac{1}{2}$. one for each spin orientations.

pauli's Exclusion principal →

↳ In any atom no two atom can have all the four quantum no to be same.

→ Each e^- will have different set of quantum no.

15/06/2023

25 hour class.

Group: t.me/saurabhpandeysir

No. of questions

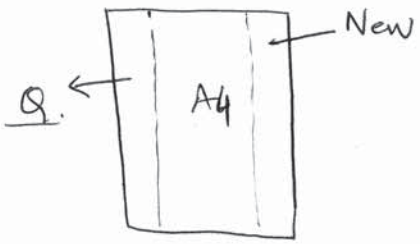
9 - 10 → 10%

easy → 3
Moderate → 4
Difficult → 3
} (6-7) can be attempted

Approach to G.S.

① Note making

150 Page



② (i) Class Note
- Solve given questions
- Previous year questions.

③ Theme based syllabus

→ Group → Telegram

→ Books and Materials
- → Class Notes
- → ICT Book
- → Questions by sir
- → Test series

ICT :

→ 25-30 hrs

ICT : Information and communication technology

ICT Syllabus :

→ Applications of ICT tools in the field of networking, e-Education and e-governance

Main Syllabus

(i) ICT Tools
(ii) Networking
(iii) e-Education
(iv) e-Goverance

→ PYQs

① ICT Tools

→ Hardware Tools
→ Software Tools
→ Printers / Monitors

② Networking

→ Network Tools
→ Network Models
→ Internet
→ Cloud Computing
→ Super computers
→ Blockchain Tech.
→ Network Security

③ e-Governance

→ What is e-gov?
→ Background
→ NeGP 1.0/ 2.0
(National e-Gov Programme)
→ Digital India Programme
→ Imp. central/state gov. e-Gov. Projects.

④ e-Education

→ Various forms of e-Education
→ Pedagogy
→ Creative Commons
→ Future of workplace.
→ Important ~~e-governance~~ e-Education related projects.

from e-gov: (4)

→ objectives / Advantage / Disadvantage — 01.

→ NeGP 1.0/2.0 ——— 01/02.

→ [Digital India Programme ——— 01/02]

Q2 — D.I.P. (vision & pillars)

↘ Programme

from e-Education

02/03 questions → (02) can be attempted.

① → Types of e-educations – adv. / disadvantage

② → Pedagogy / Any other topic.

③ → e-Education related Programmes:

→ NMEICT.

→ SSA

→ Any other new development.

⇒ Information and Communication Technologies (ICT) based tools and their applications in Engineering such as networking, e-governance and technology based education.

lecture-①

15/06/2023

e-Governance

What is e-Governance ?

→ e-Governance means ; electronics based Governance.

ancient time → hunter based governance.

British governance → 'rule of law'.

central → PM
State → CM
District → DM
Block → BDO
Gram → GramPradhan

→ e-Governance means electronic form of governance that uses information and communication technology such as wide Area Network (WAN), internet, at various level of government for the purpose of people welfare.

e-governance also means government process Re-engineering using information technology to simplify and make the govt. processes more efficient and also more effective.

Smart governance

lecture ② 16/05/2023

e-governance also means smart governance

S: Simple : Use of ICT brings simplicity

M: Moral : Morality to Governance

A: Accountable : Makes the government accountable

R: Responsive : less paper work means more responsive (less paper work & more real work.)

Responsible : Technology can convert irresponsible govt. into responsible government.

T: Transparent : Process of governance becomes transparent leaving no room for the goverment to hide any information from the citizen

Pillars of E-Governance

less use of paper & pen

To bring the process on online mode ← Process

People → To connect gov. & citizen

e-governance

Use of technology for simplicity in governance ← technology

Resource → To computerize departments and also to bring more resource for citizen use

Objectives of e-Governance

① e-governance brings information. Information brings empowerment

② e-governance brings transparency between govt. and citizen

Transparency → Trust

Trust → Good citizen-govt. relation

Good relations brings good governance.

③ e-Gov. Increases Gov – citizen interactions.
More interaction means more participation in the governance.

④ e-governance makes govt. & citizen more accountable & responsible

⑤ e-Governance reduces corruption

⑥ e-Governance reduces cost and time delay of a project

⑦ e-Governance brings good governance. Good governance means maximum welfare for the max. number of people.

Vision → larger goal (lifetime)
Objective → Immediate goal

Responsible → (जिम्मेदार)
accountable → legally. (जवाबदेही)

e.g. Balasore → train accident

Railway minister → Responsible.
Station master/engineer, ... → accountable

— accountability ↑ → corruption ↓

governance → process used by govt.

03/08/2023

PYQ

2017 (10)
2018 (7)
2019 (11)
2020 (6)
2021 (10)
2022 (12)
2023 (10)

Ethics & Values in Engineering Profession

- Ethics
- Engineering values.
- Human values
- Ethical issues in engineering

03/08/2023

lecture ①

literal Meaning of Ethics

The word ethics comes from greek word, ethika, meaning character (or) custom.

The word moral comes from Latin mores, meaning customs.

Ethics Vs Personal Morals

1970's onwards Professional Disciplines such as engineering, medicine etc., started emphasizing on ethics that was more focused on profession & how the profession was carried out... Therfore the professionals seperated ethics from personal morals.

Ethics	Morals
• Refers to professional conduct, values & principles	• Refers to personal behaviour
• An ideal standard of behaviour	• Customs practiced in any given community (or) culture
• Conveys sense of stability, permanence	• May change as acceptable social behaviour in the cultures change

Definitions of Ethics

"a body of prescriptions and prohibitions, do's & don't's"

"Ethics ... may be styled as the art of self government (regulation)"

"the standards of conduct derived from the philosophical & religious traditions of society."

"ethics is concerned about what is right, fair, just or good; about what we ought to do."

Ethics refers to ..

- branch of philosophy which seeks to address concepts of right and wrong
- branch of philosophy that is concerned with human conduct.
- Examination of the our moral judgements.
- An attempt to help humans in leading good life by applying moral principles.

Sources of Ethics ...

- Gods and Religion
- Human conscience
- The example of good human beings (role models)
- Political power (laws made by state/govt.)