SHREE DATTEA POLYTECHNIC COLLAGE, DATTANAGER, SHIROL.

CLASS TEST -01 (MODEL ANSWER PAPER)

Subject- TDE **Time-** 10:30-11:30 AM

Subject Code- 17417 Date: 23/01/2014

Marks- 25

Q1. Attempt any three 09M

a) State the necessity of transmission of electricity & state the standard transmission voltage in India.

- Ans: Generating Station are located far away from load canter's and hence the electricity need to transmit from generating stations to the point of actual utilization of it (consumers) for this purpose transmission & distribution network is necessary.
- Standard Transmission voltages in India are 765 KV(750KV), 400KV, 220KV, 132KV, 110KV, 66KV, 22KV, 11KV

c) Write characteristic or properties of line supports.

1. High Mechanical Strength
2. Light in weight
3. High resistance to corrosion
4. No Effect of Weather condition
5. Longer Life
6. Easy Access
7. Low Initial cost 8. Low Maintenance cost

b) Compare underground transmission system with overhead transmission system.

Ans:

S.No	Points	Overhead system	Underground distribution
1	**Capital cost**	Less	More
2	**Erecting cost**	Less	More
3	**Time require for completion of work**	Less	More
4	**Flexibility**	More flexibility	No flexibility
5	**Future expansion in voltage level**	System voltage can be increased easily	System voltage cannot be increased
6	**Overload capacity**	More	Less
7	**Chances of fault**	More	Less
8	**Fault finding**	Easy	Difficult
9	**Reliability**	Less	More
10	**Chances of accident**	More	No chances of accident
11	**Safety**	Less	More
12	**Radio interference**	Produces radio interferences	Not produces radio interferences
13	**Short cute route**	Difficult	possible
14	**Theft Of energy**	More possibility	Less possibility
15	**Voltage drop**	More	less
16	**Power factor**	Less	More
17	**Appearance**	Not good	Very good
18	**Application**	For Long distance transmission, For distribution rural and sub urban area.	Short distance transmission & distribution, urban areas, thickly populated area, taking supply in water (ocean) with help of marine cable.

d) Classify the transmission line based on length, operating voltage & construction.

Ans:

1) According to Length of Transmission line:

a) Short Distance Transmission Line (up to 50 KM)

b) Medium Distance Transmission Line (up to 50 to 150 KM)

c) Long Distance Transmission Line (above 150 KM)

2) According to Voltage level:

a) High voltage Transmission Line (HV)

b) Extra High Voltage Transmission Line (EHV)

c) Ultra High voltage Transmission Line (UHV)

3) **According to construction**:

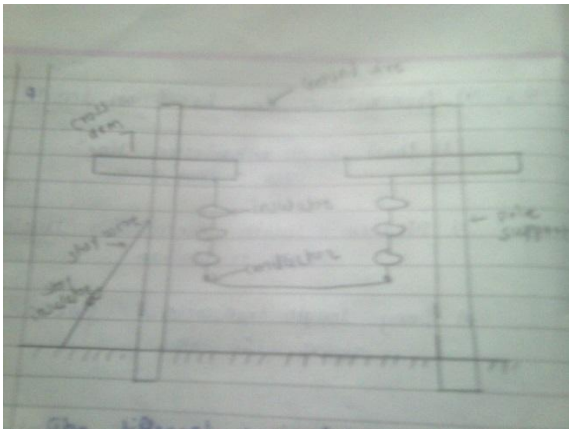
a) Underground transmission system

b) Overhead transmission system

Q2. Attempt any two 08M

a) State the different transmission line components in the system.

Ans:



1. Conductor:-

Conductors are used to carry electric power from sending end to receiving end. Conductors made up of copper, aluminum or ASCR

2. Line support:-

Line supports are used to maintain the clearance between conductor and ground supports are wooden steel, RCC are used.

3. Insulators:-

It provides support to line conductor. According to system voltage pin type, suspension type shackle type or strain type insulators are used.

4. Cross arms:-

It provides horizontal clearance between the two conductors.

5. Stay sets:-

Stay set provides supports to the end pole or corner pole.

6. Ground wire:-

It protects the transmission line from lightening strokes.

b) Compare copper & aluminum of conducting material.

Ans:

POINTS	COPPER(Cu)	ALUMINIUM(Al)
1.Conductivity	High	Low
2.Resistivity	Less	High
3. Flexibility	More	Less
4. Cross-section of conductor	Less	More
5.Mechanical strength	High	Low
6. weight	High	Low
7.Temp.coefficient of resistance	0.0038°C	0.035°C

8.Brittleness	Not brittle	brittle
9. Soldering and welding capacity	Possible	Not possible
10. Melting point	1082/1084°C	655/658°C
11. Color of material	Reddish brown	Silver white
12. Cost of material	High	Less
13. Application	For manufacturing conductor wire used for cable house wiring, transformer winding etc.	Manufacturing of over-head line conductor.

c) State the causes of failure of insulator.

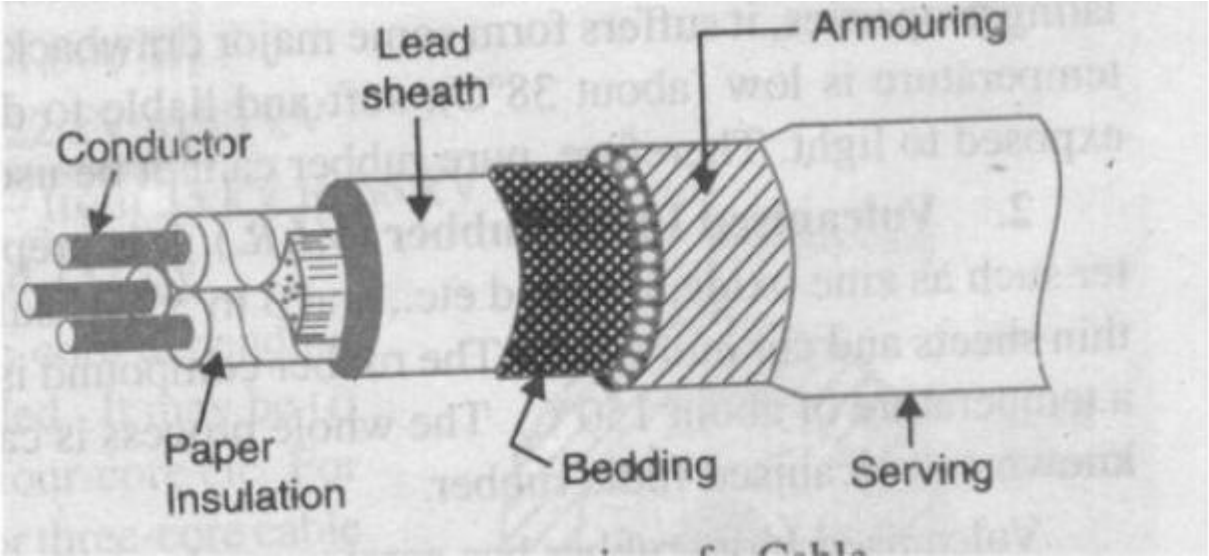
Ans: **The Reasons for the Failure of Insulators:-**
a) Manufacturing Defect
b) Uneven expansion and contraction
c) Mechanical stress
d) Porous
e) Flash over due to lighting stroke
f) Flash over due to large birds or other similar objects
g) Flash over caused due to dust deposition
h) Wrong Selection
i) Rough Handling
j) Ageing effect

Explanation:-
a) Manufacturing Defect:-
Insulator may fail due to manufacturing defect. So, it must be tested before use.
b) Uneven Expansion and Contraction:-
Insulator is manufacturing by using combination of material. For.eg: porcelain, glass, Cement and also attachment steel is used.
Co-efficient of expansion and contraction of each material is different. So, there is Possibility of cracking of insulator.so.it may fail.
c) Mechanical Stress:-
Due to mechanical stress of wind insulator may fail.
/
d) Porous:-
Porcelain is porous material. So, if insulator is not glazed properly then direct dust will accumulate on insulator and It will absorb moisture from air, so reduces resistance of insulation. Hence leakage current increase which increases temperature of insulator. It may cause failure of insulator.
e) Flashover due to lightning stroke:-
If lightning stroke directly attacks on insulator than there is flash over and causes failure of insulator**.**

f) Flash over due to large birds or similar objects:-
Large birds or similar objects causes short circuit resulting in flash over and causes of failure insulator.
g) Flash over caused due to dust deposition:-
Transmission line running over dusty area for ex: coal mine, large stone crusher, cement factory.
Dust will deposit on insulator which reduces clearance between two conductors. So, there is possibility of flash over and causes failure of insulator.
h) Wrong Selection:-
If 11 KV insulators are used for 22 KV, then it causes failure of insulator.
i) Rough Handing:-
Due to rough handling of insulator during transportation, construction of line work etc.Causes failure of insulator.
j) Ageing Effect:-
Due to continuous use of insulator for a long period, its dielectric strength reduces. So, it may be causes of failure insulator .

Q3. Attempt any two **08M**

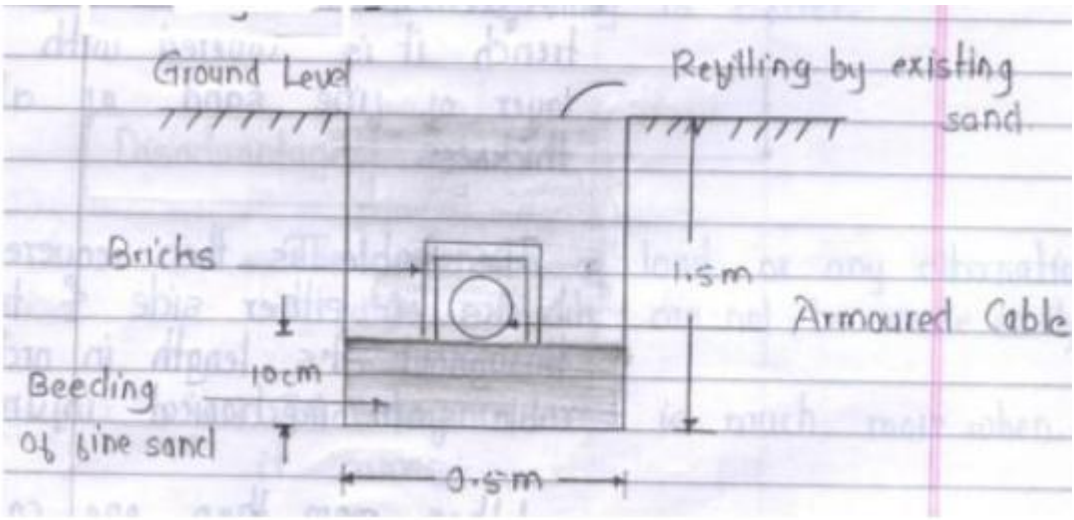
a) Draw the construction diagram of 3 conductor high voltage underground cable.
Ans:



b) State the types of cable laying method & explain 'Direct laying method'.

Ans:
1. Direct laying cable
2. Draw- in system
3. Solid System
4. Cable laid in tray

Direct laying method



- For laying of a cable trench about 1.5m deep and 0.5m wide is made along the cable route.
- A layer of 10 cm thickness of soft soil is spread throughout the cable route in trench.
- The cable is laid on this soft soil (bed)
- A wall of bricks (concrete cover) is provided on either side or top of cable along the length of cable for better mechanical protection.
- Another layer of soft sand, about 10 cm thickness is spread throughout its cable length.
- Refill the remaining trench with the help of remaining soil up to ground level.
- While crossing roads (public-crossing) cable is laid through cement pipe or DWC pipe, instead of bricks for better mechanical protection.
- When more than 1 cable is to be laid in the same trench, then minimum 30 cm spacing is provided between 2 cables and gap is filled by sand.
- The spacing is kept between 2 cables to reduce the effect of mutual heating and also fault occurring on one cable does not damage the adjacent cable.
- Only armoured cables are used in this method.

c**) Each line of a 3-phase system is suspended by a string of 3 similar insulators. If the voltage across the line unit is 17.5kv. Calculate the line to neutral voltage. Assume that the shunt capacitance between each insulator and earth is 1/8^th of the capacitance of the insulator itself. Also calculate the string efficiency.**

Ans: Givn n=3, V_3 =17.5kv, m=1/8

Find Vph & string efficiency

Step 1) m=1/8

=0.125

Step 2) we know V_3 **=V_1 (1+3m+m^2)**

17.5=V_1 (1+3(0.125)+$(0.125)^2$)

V_1 =12.59kv

Step 3) we know V_2 =V_1 (1+m)

V_2 =12.59(1+0.125)

V_2 =14.16kv

Step 4) V_{ph}=V_1+V_2+V_3

V_{ph} =12.59+14.16+17.5

$V_{ph=}$ 44.45kv

Step 5) V_L = V_{ph} * √3

=44.45*√3

V_L =76.60kv

Step 6) string efficiency = $\frac{Vph}{n*vn}$

$=\frac{44.25}{17.5*3} * 100$

string efficiency =84.24%