

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular), November 2017

B. Tech. in Electrical Engineering, Semester VII

Roll No.....

EE 703: Testing and Commissioning of Electrical Machine Time: 3 hours Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
 2. Assume suitable data wherever required and mention it clearly.
 3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.
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Q.1A Objective type multiple choice questions (10 questions @ 1 mark) 10

- i. Current flow between steps is known
 - (a) Step potential (b) Touch potential (c) Amperage (d) None
- ii. What should be the minimum clearance for laying power cables near communication lines?
 - (a) 0.2 m horizontally and vertically (b) 0.6 m horizontally and vertically
 - (c) 1 m horizontally and vertically (d) 1.5 m horizontally and vertically
- iii. What is the reason for excess reading of the energy meter?
 - (a) Defective wiring (b) Meter defects (c) Over voltage (d) Both (A) & (B)
- iv. The degree of mechanical vibrations produced by the laminations of a transformer depends on
 - (a) tightness of clamping (b) gauge of laminations
 - (c) size of laminations (d) all of the above
- v. What is the factor of safety used for 11 KV pin type insulator?
 - (a) 1 (b) 1.5 (c) 2.5 (d) 2
- vi. Most familiar application of zig - zag transformer is as
 - (a) Ground reference on an ungrounded system
 - (b) Converting single phase to two phase
 - (c) Reducing harmonics (d) All of these
- vii. What is a preventative maintenance schedule?
 - (a) A list or a plan of a building providing information of number of points in each room.

- (b) The list of all the electrical components required for a particular room
- (c) The list of electrical components along with their prices'
- (d) Both (B) and (C)
- viii. Which of the gas is used in gas insulated substation:
- (a) Nitrogen + SF₆ (b) Hydrogen + SF₆
- (c) SF₆ (d) None of the above
- ix. A person qualified to perform electrical work must possess:
- (a) Skills/ techniques to distinguish live parts from other parts of electrical equipment.
- (b) Skills and techniques to determine the nominal voltage of exposed live parts.
- (c) Knowledge on the use of PPE, insulating and shielding materials, and insulated tools.
- (d) All of the above
- x. What should be the value of earthing resistance for 132 KV line?
- (a) 1 Ω (b) 0.5 Ω (c) 10 Ω (d) 5 Ω
- Q.2 Short answer type questions (4 questions @ 2.5 marks) 10
- i. How many types of cooling system it transformers
- ii. Why in a three pin plug the earth pin is thicker and longer than the other pins?
- iii. Differentiate between MCB & MCCB.
- iv. Describe factor affecting earth resistance of substation.
- Q.3A States various steps in the installation and commissioning of induction motors. 05
- Q.3B Discuss causes of troubles and failure of Transformers and their remedy. Also 05
explain procedure of inspection of an electrical machine prior to its installation.
- Q.4A Write down specification for following items. 05
- Ultimate tension for 11 KV PCC pole
 - Horizontal clearance from building 400 V line
 - Current rating for weasel conductor
 - SWG Size for 25 Ampere drop out fuse
 - 11 KV lightening Arrestor peak voltage
- Q.4B For the following conditions explain in detail troubles, causes and its 05
remedies
- Induction motor working with abnormal temperature.

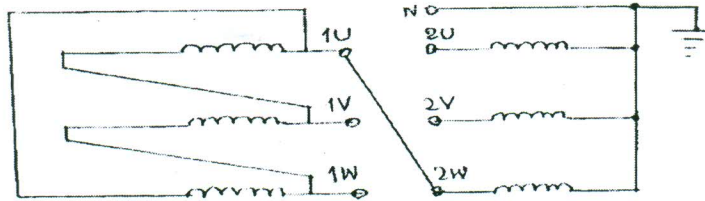
- Transformer does not trip.

Q.5A Why sweep frequency response analysis test conducted for physical condition monitoring of a transformer. With the help of suitable diagram explain it in detail. 05

Q.5B A test is conducted for 132/33 KV, 50 MVA transformers at principal taping to check DY11 Vector group and following voltage are measured. 05

- Voltage applied to HV side 445 (Ph - Ph)
- Voltage across Secondary : 51 V (Ph - Ph)

To confirm DY11 vector group compute expected voltages as shown below table



Voltage across	Voltages expected for DY 11	Voltages obtained
1V - 2V		450 V
1W - 2V		490 V
1W - 2U		490 V

Q.6A (a) List out the factors affecting the insulation resistance. 03

(b) Explain term (a) Dielectric Strength (b) Polarization Index 02

Q.6B Discuss the possible causes for transformer oil deterioration and explain transformer oil and winding temperature rise test. 05

OR

At principal taping, a test is conducted to find out core magnetic paths for a 220/132 KV, 100MVA Power Transformer, DY11. The Supply given to LV side, HV kept open and following voltage is measured. To confirm magnetic balancing write expected voltages as shown below table

S.No.	Voltage applied	Voltage obtained
1.	2U-N= 228.4 V	2V-N= 174.0 V 2W-N=.....
2.	2V-N=224.3 V	2U-N=..... 2W-N=109.3V
3.	2W-N=223.4 V	2U-N=..... 2V-N=169.7 V

Q.7A Explain different methods of Drying out of Rotating Machine 05

Q.7B Explain Fisher Loop test for finding cable fault 05

OR

- Q.7B Explain Varley loop test for finding cable fault 05
- Q.8 (a) State the various types of enclosures for rotating electrical machines and the type of cooling adopted in them. 05
- (b) Explain the causes and remedies of unbalance input current in 3- phase induction motor. 05
- Q.9A (a) Explain with the help of circuit diagram the partial discharge test of transformer. 07
- (b) Write down significance of $\tan \delta$ test on transformer 03
- Q.9B (a) Explain the harmful effects of vibration. How are the vibration measured. 03
- (b) With the help of suitable diagram, explain direct short circuit test used for testing of isolators and circuit breakers in laboratories. 05
- (c) What kind of protection is adopted against the penetration of water on electrical drives? 02

OR

- Q.9B Design of earthing system for HV/EHV AC substation. The input parameters are shown as below 10

Parameters	Symbol	Value	Units
Ambient temperature	Ta	45	°c
Maximum allowable temperature	Tm	450	°c
Fault duration time	ts	1s	Sec
Thermal coefficient of resistivity	α_r	0.0032	
Resistivity of conductors	ρ_r	20.1	$\mu\Omega/\text{cm}$
Resistivity of substation soil	ρ	201.8	Ωm
Resistivity of surface material	ρ_s	2000	Ωm
Thermal capacity factor	TCAP	3.931	$\text{J}/\text{cm}^3/^\circ\text{C}$
Depth of burial conductor	h	0.6	m
Reference depth of grid	ho	1	m
Conductor spacing	D	7	m
Diameter of grid conductor	d	34	mm
Length of one earth rod	Lr	3	m

Determine followings particulars

(a) Step voltage criteria

(b) Touch voltage criteria