2012

ELECTRICAL EQUIPMENT IN POWER STATION

Time Allotted : 3 Hours Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ten of the following:

$10 \times 1 = 10$

i) Silicon is added to CRGO steel for manufacturing of core stamping to reduce

a) hysteresis loss

b) eddy current loss

c) windage loss

d) all of these.

ii) Which type of bearing is used to support the rotor of large size turbo generator ?

a) Tilting pad type

b) Journal type

c) Thrust pad type

d) Roller type.

iii) A 210 MW generator neutral is generally grounded through

a) high resistance box

b) low resistance box

c) distribution transformer & a low resistance at LV side

d) reactor box.

iv) At under excited condition which part of the generator

gets over heated ?

a) Stator winding over hand

b) Rotor winding over hand

c) Retaining ring portion

d) All of these.

v) To prevent harmful corona effect, the finished bar are coated with

a) epoxy layer

b) white paper

c) copper plate

d) an abrasion resistance semi-conductive layer.

vi) The function of the damper bar in the rotor winding is

a) to damp out lower frequency of oscillation imposed on the rotor

b) act as an induction generator at super synchronous speed

c) act as an induction motor at sub-synchronous speed

d) all of these.

vii) The complete bearing is insulated from the foundation / end shield to

a) prevent the flow of shaft current

b) improve the mechanical strength

c) allow gas passage

d) control the temperature.

viii) Generator shaft seals oil pressure is kept

a) slightly higher than the H_2 pressure

b) slightly lower than the H_2 pressure

c) Equal to the H_2 pressure

d) Very higher than the H_2 pressure.

ix) Purity & Humidity (RH) maintained inside the turbo

generator is respectively

a) <90%, <50% b) ≥98%, <50%

c) <70%, <20% d) ≥98%, <100%.

x) The conductivity of water is stator water cooling system of turbo generator is typically maintained between

a) 100-200μs/Cm b) 0.5-1.5μs/Cm

c) 40-50μs/Cm d) none of these.

xi) In stator water cooling system, water pressure inside the stator bar is maintained

a) slightly higher than the H_2 pressure

b) slightly lower than the H_2 pressure

c) very higher than the H_2pressure

d) Equal to the H_2 pressure.

xii) Stator bars are manufactured as

a) transposed, half coil shape

b) transposed, diamond coil shape

c) non-transposed, half coil shape

d) non-transposed, diamond coil shape.

GROUP – B

(Short Answer Type Questions)

Answer any three of the following. 3 × 5 = 15

2. What will be nature of voltage if the rotor winding is excited with A.C. voltage in place of D.C. excitation ?

3. Why the generator should not be operated at under excited condition for a long period of time.

4. Why helium is not used for cooling in our country ? For what reason, oil is not used in place of DM water in stator water cooling system of a generator ?

5. If the generator is made with high value of SCR then what will be the change in field winding design ? Explain briefly.

6. At time of synchronization, explain why the incoming

generator should be little beat fast.

GROUP – C

(Long Answer Type Questions)

Answer any three of the following. 3 × 15 = 45

7. a) For which properties hydrogen is used as a cooling medium rather than air ? Why the purity of hydrogen inside the generator should be maintained at higher side ? 3 + 2

b) Write down the general procedure of removing hydrogen from generator when it undergoes on overhauling. 5

c) Write down the function of on line hydrogen dryer. Also mention its requirement. 3 + 2

8. a) Draw & describe the schematic diagram of a stator water cooling system. 10

b) i) Is there any requirement of a separate DC pump ?

ii) What is the importance of oxygen monitoring system ?

iii) If any water or oil leakage occur inside the generator, how it can be detected ? 1 + 2 + 2

9. a) What are the different types of seal oil system ? Why the hydrogen side seal oil circuit is treated with separate circuit ? 2 + 3

b) What is the function of Differential Pressure Regulator (DPR) & Pressure Balancing Regulator (PBR) ? Draw the schematic diagram of 'Ring' type seal oil system. 5 + 5

10. Draw & describe the scheme of Static Excitation system of a turbo generator.

Or

Draw & describe the scheme of Brushless Excitation system of a turbo generator. 10

i) Write down the function of AVR (Automatic Voltage

Regulator).

ii) What is the function of 'Follow up controller' ?

iii) Explain briefly, how field discharge takes place in the excitation system. 2 + 1 + 2

11. a) Write down the advantages of SF_6 circuit breaker. "A no loaded long HV cable can be interrupted by Air Circuit Breaker (ACB)." Explain briefly. 3 + 5

b) Show mathematically, when a circuit breaker is interrupted high transient voltage is generated across the breaker contact. 7

12. Write short notes on any three of the following : 3 × 5

a) The winding structure of 24 slots, 3-phase, 2-pole, 30° short pitch angle, double layer, parallel star winding.

b) SCT (Saturable Current Transformer) & PPT (Power Potential Transformer) excitation scheme.

c) Generator grounding through NGT (Neutral Grounding Transformer).

d) Vacuum Circuit Breaker (VCB).

e) Distribution scheme (Single Line Diagram) of a Generating station (Considering Generator/NGT/ GT/Breaker/UAT/SAT/busbars/loads etc).

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