KATHMANDU UNIVERSITY
End Semester Examination
December, 2024

Marks Scored:

Level : B.E.
Year : IV
Course : EPEG 428
Semester : I

Exam Roll No. :
Time: 30 mins.
F. M. : 10

Registration No.:
Date : 31 Dec 2024

SECTION "A"
[20Q. × 0.5 = 10 marks]

Choose the most appropriate answer and **encircle**.

1. _____ refers to the object's ability to carry out its intended task in accordance with given parameters.
   a. Up-state b. Healthy state c. Limiting state d. Out-of-order

2. Failure in an electric motor CAN NOT be distinctly classified according to
   a. Cause of the failure b. Nature of failure
   c. Rating of the motor d. Dependability on other failures

3. Which one of these is NOT the consequence of equipment failure
   a. Environmental concerns b. Opportunity cost
   c. Operation Delays d. Increased energy consumption

4. Preventive maintenance refers to the
   a. Preservation of initial consumption value of euipment
   b. Restoration of initial consumption value of equipment
   c. Enhancement of initial consumption value
   d. None of the above

5. The benefits of condition monitoring is
   a. Decreased maintenance costs b. Reduced downtime of equipment
   c. Extended lifetime of equipment d. All of the above

6. Which one of these is NOT an invasive technique used for fault diagnosis of machines
   a. Acoustic emission analysis b. Dissolved Gas Analysis
   c. Motor Current Signature Analysis d. Vibration Analysis

7. Insulation resistance test can be performed on
   a. Generator b. Transformer c. Motor d. All of the above

8. Tan-delta test is performed to
   a. Identify insulation degradation b. Measure power factor
   c. Detect stator winding short circuit d. All of the above

9. PT100 is a
   a. Vibration sensor b. Temperature sensor
   c. Flux sensor d. Acoustic Sensor

10. The sensor used for measuring acoustic emission is a
a. Resistive sensor b. Capacitive sensor c. Inductive sensor d. Piezoelectric sensor

11. Which one of these is NOT a classification of transformer according to the insulation or cooling
a. Class A b. Class C c. Class O d. Class L

12. The normal temperature distribution in a transformer is such that the hottest point is
a. In the outer frame b. Top of the winding
c. In the insulation system d. In the outer surface of the winding

13. A good quality of oil in the transformer generally has the tan-delta value of
a. <0.2 b. >0.2 c. = 0.2 d. None of the above

14. Which one of the following is a method to diagnose fault in transformers?
a. Partial Discharge Test b. Dissolved Gas Analysis
c. Frequency Response Analysis d. All of the above

15. Which one of these is NOT a health indicator of a machine?
a. Harmonics in voltage and current signals
b. Increased temperature in the windings
c. Higher amplitude of vibration
d. Bearing of the shaft

16. According to IEEE, which one of the following is the most occurring fault in induction motors?
a. Bearing Fault b. Stator Fault c. Fault d. Other Faults

17. Which of the following machine parameters CANNOT be used for the diagnosis of bearing faults?
a. Stator current b. Vibration
c. Magnetic flux density d. Torque

18. A broken rotor bar will cause
a. High current density in the stator winding
b. Low current density in the stator winding
c. High current density in the neighboring rotor bar
d. Low current density in the neighboring rotor bar

19. For an induction motor with 28 rotor slots, slip 0.02 and operating at 50 Hz supply, an inter-turn fault in the stator will cause a rotor slot harmonic at
a. 650 HZ b. 1300 Hz c. 2700 Hz d. 3400 Hz

20. Fault diagnosis using machine learning is considered to be
a. Model based technique b. Invasive technique
c. Non-invasive technique d. Data driven technique

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SECTION "B"
[4 Q. × 10 = 40 marks]

*Attempt **ANY FOUR** questions.*

1.
   a. Describe briefly different maintenance techniques used in power and manufacturing industries. [4]
   b. What is condition-based maintenance? Compare condition-based maintenance and predictive maintenance using examples. [2+4]

2.
   a. What do you understand by condition monitoring of electrical machines? What is the difference between condition checking and trend monitoring, explain with examples? [2+3]
   b. Describe briefly different invasive and non-invasive condition monitoring techniques used for electrical machines. [5]

3.
   a. What is a data acquisition system? Draw a generic block diagram to explain how data acquisition system works in condition monitoring of electrical machines. [5]
   b. Discuss the insulation class generally used in transformer and explain its significance. [5]

4.
   a. What is High Voltage Partial Discharge Test (HVPD) and why is it important in transformer? [5]
   b. What is eccentricity in rotating electrical machines? Describe different types of eccentricity problems? [5]

5.
   a. Explain what is Motor Current Signature Analysis (MCSA) and how is it used for diagnosis of electrical machine faults. [4]
   b. What are the different types of stator-winding faults that occur in rotating electrical machines? Discuss about inter-turn fault in motor and its diagnosis. [3+3]