

**GENERAL CERTIFICATE OF EDUCATION BOARD**  
Technical and Vocational Education Examination

**JUNE 2022**

**ADVANCED LEVEL**

|                            |                                     |
|----------------------------|-------------------------------------|
| Specialty Name and Acronym | ELECTRICAL POWER SYSTEMS – EPS (F3) |
| Centre N°                  |                                     |
| Centre Name                |                                     |
| Candidate N°               |                                     |
| Candidate Name             |                                     |

Mobile phones are **NOT** allowed in the examination room

**AUTOMATIC CONTROL OF ELECTRICAL MACHINES 1: MULTIPLE CHOICE  
QUESTION PAPER**

**One and a half hours**

**INSTRUCTIONS TO CANDIDATES**

*Read the following instructions carefully before you start answering the questions in this paper. Make sure you have a soft HB pencil and an eraser for this examination.*

1. USE A SOFT HB PENCIL THROUGHOUT THE EXAMINATION.
2. DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

*Before the examination begins:*

3. Check that this question booklet is headed **Advanced Level – 7240 Automatic Control of Electrical Machines 1**
4. Insert the information required in the spaces above.
5. Insert the information required in the spaces provided on the answer sheet using your HB pencil:  
**Candidate Name, Exam Session, Subject Code, Centre Number and Candidate Number.** Take care that you do not crease or fold the answer sheet or make any marks on it other than those asked for in these instructions.
6. **Answer ALL questions**
7. Each question has **FOUR** suggested answers: **A, B, C** and **D**. Decide on which answer is correct. Find the number of the question on the Answer Sheet and draw a horizontal line across the letter to join the square brackets for the answer you have chosen.  
For example, if **C** is your correct answer, mark **C** as shown below:  
[A] [B] [C] [D]
8. Mark only one answer for each question. If you mark more than one answer, you will score a zero for that question. If you change your mind about an answer, erase the first mark carefully, then mark your new answer.
9. Avoid spending too much time on any one question. If you find a question difficult, move on to the next question. You can come back to this question later.
10. Do all rough work in this booklet, using, where necessary, the blank spaces in the question booklet.
11. Texts, notes and pre-prepared materials of any kind are also **NOT** allowed in the examination room.
12. **At the end of the examination, the invigilator shall collect the answer sheet first and then the question booklet after. DO NOT ATTEMPT TO LEAVE THE EXAMINATION HALL WITH IT.**

*Turn Over*



1. If an extra resistance is connected in the rotor circuit of a slip ring induction motor, then
- Starting current and torque decreases
  - Starting current increases and torque decreases
  - Starting current decreases and torque increases
  - Starting current and torque increases

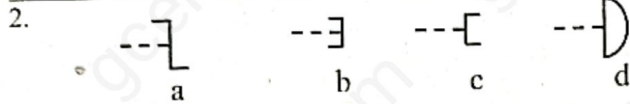


Figure 1

The figure 1 shows symbols of command organs. The command organ operated by pulling is

- ONE
  - TWO
  - THREE
  - FOUR
3. How many starting steps has an auto-transformer starter?
- ONE
  - TWO
  - THREE
  - FOUR
4. For a Direct On Line starter, the ratio of the starting current ( $I_s$ ) to the normal current ( $I_n$ ) is
- $I_s/I_n=8$
  - $I_s/I_n=6$
  - $I_s/I_n=4$
  - $I_s/I_n=2$
5. The main parts of three phase induction motor are:
- Rotor and Stator
  - Stator and field
  - Slip ring and brushes
  - Rotor and armature
6. After the wiring of a star-Delta starting, you realize that the system switches instantaneously from star to Delta. What could be the problem?
- The hold-on contact of the star line is not connected
  - The Delta contactor is faster than the star contactor
  - The star control line does not have the interlock
  - The time on the delay contact block is regulated at zero

7.

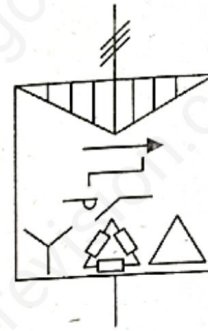


Figure: 2

The starter of figure-2 has:

- One starting steps.
  - Three starting steps.
  - Four starting steps.
  - Two starting steps.
8. A three phase 220V, 50Hz supply network supplies a three-phase tetra-polar wound rotor induction motor whose name plate carries 220V/380V. This motor shall be coupled to the supply network in
- Star
  - Zigzag
  - Delta-star
  - Delta

9.

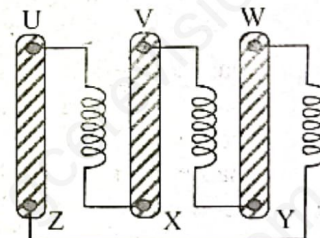


Figure 3

Figure 3 shows the terminal connections of a three phase asynchronous motor. The motor is coupled in:

- Delta
  - Star
  - Zig-zag
  - Star - Delta
10. A non-volatile memory that can retain the stored information even when not powered is called
- ROM
  - RAM
  - AERAM
  - DRAM



11. The resistance between two terminal of a 3-phase squirrel cage motor is  $R$  and the resistance of each winding of the motor is  $r$ , if the windings of the motor is coupled in star, the relationship between  $R$  and  $r$  is,

A  $r = 2R$   
 B  $r = 1.5 R$   
 C  $r = R$   
 D  $r = 0.5R$

12. Eddy currents are reduced by  
 A laminating the magnetic circuit.  
 B varying the current with a rheostat  
 C varying the voltage with a potentiometer.  
 D using low reluctance material for the magnetic circuit.

13. In a dc generator, the generated e.m.f. is directly proportional to the  
 A Armature resistance  
 B Number of armature parallel paths  
 C Flux per pole  
 D Field resistance

14. A transformer having 1000 primary turns is connected to a 250V-a.c. supply. For a secondary voltage of 400V, the number of secondary turns should be  
 A 1600  
 B 250  
 C 400  
 D 1250

15. In a three phase induction machine  
 A stator core alone is laminated  
 B rotor core alone is laminated  
 C both stator and rotor are laminated  
 D stator core is laminated, but the rotor may or may not be laminated

16. If an extra resistance is connected in the rotor circuit of a slip ring induction motor, then  
 A Starting current and torque decreases  
 B Starting current increases and torque decreases  
 C Starting current decreases and torque increases  
 D Starting current and torque increases

17. Transformer cores are laminated in order to  
 A Simplify its construction  
 B Minimize eddy current loss  
 C Reduce cost  
 D Reduce hysteresis loss

18.

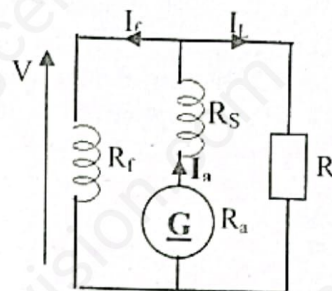


Figure 4

From figure 4, the expression  $(I_a - V/R_f)$  represents the

A shunt field current  
 B load current  
 C armature current  
 D series field current

19. One of the methods of starting a three phase induction motor is:  
 A Star-Star  
 B Delta-Star  
 C Delta-Delta  
 D Star-Delta

20. To change the direction of rotation of a dc motor you should  
 A Interchange the direction of current either in the field or armature winding but not both  
 B Changing the terminals of the motor  
 C Interchanging the armature in series with the field  
 D Connecting the armature in series with the field

21. A short circuit test on a transformer is to determine  
 A Copper losses  
 B Hysteresis losses  
 C Iron losses  
 D Sum of copper losses and iron losses

22. The rule that determines the direction of induced e.m.f. is  
 A Fleming's right hand rule  
 B Fleming's left hand rule  
 C cork screw rule  
 D right hand grip rule

23. In a motor starter a contactor is energized when the start push button is pressed and de-energised when it is released. This is because the  
 A Supply current is low  
 B Flux of the coil is low  
 C Hold-on contact is absent  
 D Auxiliary contact is absent



24. The suitable method to control the speed of a three – phase induction motor over a wide range is
- line frequency control
  - line voltage control
  - rotor rheostat control
  - pole changing method

25.

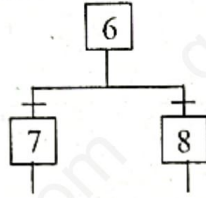


Figure 5

The structure of the GRAFCET of figure 5 represents

- OR Convergence
- OR divergence
- AND Convergence
- AND divergence

26.

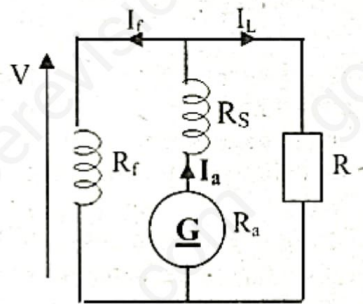


Figure 6

The expression  $\frac{V}{R_f} + I_L$  from figure 6 represents:

- shunt field current
- load current
- armature resistance
- series field current

27. A three phase slip ring asynchronous motor could be started using
- auto transformer
  - star delta
  - direct on line
  - rotor resistance

28. Transformers are rated in KVA instead of KW because
- Load power factor is often not known
  - KVA is maximum supplied power of a transformer whereas KW depends on load and power factor
  - Total transformer loss depends on volt – ampere
  - It has become customary

29.

The meter used to measure the speed of an asynchronous motor is

- Tachymeter
- Tachometer
- Wattmeter
- speedometer

30.

In a GRACET operation, the hold-On contact generally used in control circuit is numbered to as;

- 13 and 14
- Hold-On contact
- Memorization
- Maintained contact

31.

A transformer has negative voltage regulation when its load power factor is

- Unity
- Zero
- Leading
- lagging

32.

For a single-phase induction motor, its starting winding is placed in the

- Rotor
- Armature
- Stator
- Field

33.

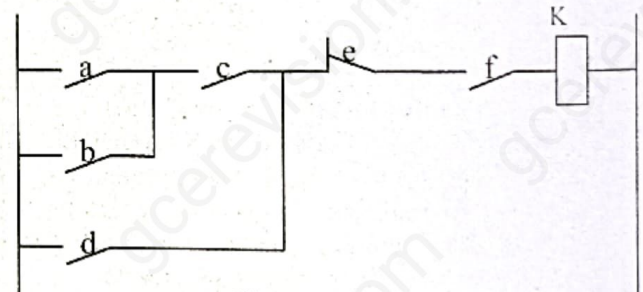


Figure 7

The corresponding logic equation of K in Figure 7 is

- $K = (a+b.c)d.e.f$
- $K = (a+b.c)d \bar{e}.f$
- $K = (ac+bc) + d) \bar{e}.f$
- $K = ((ac+bc) + d) \bar{e}.f$

34.

In a single-phase induction motor, if its starting winding is left on permanently after starting, it will

- Draw excessive current and overheat
- Run slower
- Run faster
- Spark at light loads



35. The direction of rotation of a single phase induction motor is reversed by
- Reversing either the starting or running winding
  - Reversing both the starting and running winding
  - Reversing the starting winding
  - Reversing the running winding

36.

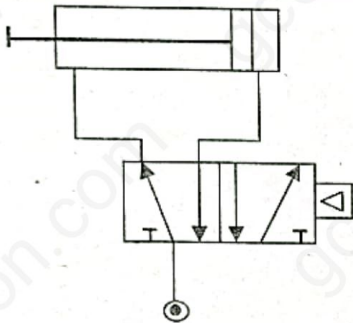


Figure 8

The diagram of figure 8 is :

- 5/2 Directional control valve(Distributor)
  - 4/2 Directional control valve(Distributor)
  - 3/2 Directional control valve(Distributor)
  - 5/3 Directional control valve(Distributor)
37. The motor preferred for traction work is
- Universal motor
  - DC series motor
  - Asynchronous motor
  - Shunt motor
38. In a Star-to- zig-zag connected transformer, the secondary has
- 3 winding and 6 terminals
  - 6 winding and 9 terminals
  - 6 winding and 12 terminals
  - 6 winding and 12 terminals

39.

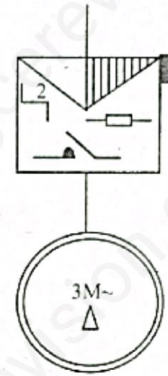


Figure 9

The starter in Figure 9 is

- Semi automatic
- Star-delta
- Autotransformer
- Resistance Start

40.

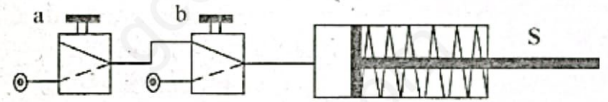


Figure 10

The pneumatic system of figure 10 has a logic equation of:

- $a + b = S$
  - $ab = S$
  - $\overline{a + b} = S$
  - $\overline{ab} = S$
41. For a three phase 380/660V motor the supply voltage suitable for star-delta starting is:
- 380/660v.
  - 220/380v.
  - 127/220v.
  - 660v.
42. An asynchronous motor can be designed to function on two speed levels by
- coupling the three stator or rotor winding terminals, to have the two speed
  - either using a separate stator or rotor windings
  - using a three stator windings and coupling the rotor windings terminals for each speed
  - using two sets of stator windings and arranging the coupling for each speed
43. Which among the following is not an actuator in an automatic control systems
- Cylinders
  - Valves
  - Electric motors
  - Pneumatic jacks

44. Which of the four sequencers listed below is designed with an AND gate, an OR gate and a BISTABLE?

- A Electromagnetic sequencer
- B Electro-mechanic sequencer
- C Electronic sequencer
- D Pneumatic sequencer

45. The function performed by the Pneumatic cylinders from the given list below

- A Transform pressurized fluid into electrical energy
- B Transform pneumatic energy into pressurized energy
- C Transform pneumatic energy into mechanical energy
- D Transform mechanical energy into pneumatic energy.

46. With the use of programmable logic controllers (PLC), humans' interventions are limited to:

- A Processing the information,
- B Analyzing the processed data,
- C Entering and monitoring of information
- D Maintaining of the information entered into the PLC.

47. Which among the following is not a PLC programming language?

- A The Boolean algebra programming language,
- B The ladder programming language,
- C The GRAFCET programming language,
- D The Boolean contacts programming language

48. Which among the following is not a phase modules?

- A System phase modules
- B Pneumatic phase modules
- C Electronic phase modules
- D Electric phase modules

49. The first objective of protecting a three phase induction motor is to protect the windings against

- A Thermal short circuit,
- B Thermal over load,
- C Very high current,
- D System imbalance.

50. The protective device that protects an induction motor against overload is

- A Fuse isolator
- B Circuit breaker,
- C Magneto- thermal relay
- D Thermal relay

**STOP**

**NOW GO BACK AND CHECK YOUR WORK**