



**COLLEGE: COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY (CEST)**

**SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING**

**PROGRAMME: CERTIFICATE IN ELECTRICAL SERVICEMAN'S COURSE**

**UNIT CODE: EEE221**

**UNIT TITLE: APPLIED ELECTRICITY 2**

**FINAL EXAMINATION – PENSTER 2, 2017**

**ROOM: AS PER TIMETABLE**

**DURATION OF EXAMINATION: 2 HOURS 10 MINUTES**

**TOTAL MARKS - 100**

**INSTRUCTIONS TO STUDENTS**

1. You are allowed **10 minutes** extra **reading time** during which you are **NOT** to write.
2. Begin each **SECTION** on a fresh page and use both sides of the sheet.
3. Write your candidate number at the top of each attached sheet.
4. Insert all written foolscaps, graph paper, drawing paper, etc. in their correct sequence and secure with a string.
5. For all sheets of paper on which rough/draft work has been done, cross it through and **ATTACH** these to your answer scripts.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. Use of programmable calculator(s) is prohibited.
- 8. ANSWER ALL QUESTIONS**
9. Show all working where necessary.
- 10. ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE EXAM ROOM.**

**SECTION A:****MULTIPLE CHOICE****(20 MARKS)**

*In each of the following statements, one of the suggested answers is the best one. Write the identifying letter of the answer beside the question number on your answer sheet.*

1. Three phase star connection is best suited for:
  - A. Long distance power transmission
  - B. Power transmission
  - C. Domestic Loads
  - D. Locally operated machinery
  
2. Three phase Delta connection is more suitable for:
  - A. Unbalanced loads
  - B. Balanced loads
  - C. 240 V loads
  - D. 415 V loads
  
3. There is no common earthing point in:
  - A. Star connection
  - B. Star Delta connection
  - C. Delta connection
  - D. All of the above
  
4. Three phase star connection has:
  - A. 240 Volts
  - B. Single phase
  - C. One voltage value
  - D. Two voltage values
  
5. One of the characteristic of delta connection is that it has:
  - A. Dissimilar ends connected
  - B. Similar ends connected
  - C. Positive and negative
  - D. Phase and neutral
  
6. In a star connected system the line current equals the:
  - A. Line voltage
  - B. Phase current
  - C. Phase voltage
  - D. voltage
  
7. In a delta connected system the line voltage equals the:
  - A. Current
  - B. Phase current
  - C. Phase voltage
  - D. Voltage

8. The direction of rotation of a split phase motor is reversed by:
  - A. Interchanging connections of both winding
  - B. Reversing the rotation
  - C. Taking out one winding
  - D. Interchanging connections of any one winding
  
9. A capacitor start motor has:
  - A. Moderate increase torque
  - B. Low torque
  - C. High torque
  - D. All of the above
  
10. One of the applications of shaded pole motor is in:
  - A. Air con
  - B. Fans and blowers
  - C. Stepper motor
  - D. Hand held appliance
  
11. A split phase motor has two windings, Run winding and:
  - A. Winding
  - B. Stop Winding
  - C. Start Winding
  - D. Steel cable
  
12. Series motor is often referred to as:
  - A. High speed
  - B. Union motor
  - C. Motor
  - D. Universal motor
  
13. A capacitor start capacitor run motor has:
  - A. Two capacitors
  - B. One capacitor
  - C. Three capacitors
  - D. No capacitors
  
14. Parts of a DC motor:
  - A. Armature
  - B. Yoke
  - C. Field poles
  - D. All the above
  
15. Reversal of rotation of three phase motors is achieved by interchanging:
  - A. All three lines
  - B. One line
  - C. Any two lines of supply
  - D. All of the above

16. Transformers are rated in:
- Power
  - kilowatts
  - Watts
  - VA or KVA
17. The transformer cooling is achieved by:
- Turns ratio
  - Transformer regulation
  - Tapping
  - Air and Oil
18. Two type of three phase rotors are:
- Windings and bearing
  - Rotor bars and brushes
  - Squirrel cage and wound
  - Shunt and compound
19. In a shunt motor the field is connected in:
- series to armature
  - Mixed to armature
  - Parallel to the armature
  - armature
20. In \_\_\_\_\_ the field and armature are in series with the supply.
- all motors
  - Small motor
  - Shunt
  - Series motor

**SECTION B**

**MATCHING**

**(10 MARKS)**

*Write down the question numbers in your answer booklet and beside it write the best matching letter.*

- |                           |                        |
|---------------------------|------------------------|
| 1. Transformer rating     | A. Carbon              |
| 2. Delta connected system | B. Silicon             |
| 3. Series motor           | C. $n_s - n_r$         |
| 4. Capacitor Start motor  | D. Main frame          |
| 5. Core/Shell type        | E. $\sqrt{2} V_{ac}$   |
| 6. Brushes                | F. Transformer core    |
| 7. Motor Component        | G. Moderate torque     |
| 8. Diode                  | H. Low starting torque |
| 9. Slip Speed             | I. One voltage         |
| 10. PRV                   | J. KVA                 |

**SECTION C****THEORY****30 MARKS**

1. With aid of diagram explain how three phase is generated. (4 marks)
2. State the phase sequence of a three phase system. (1 mark)
3. Name three starting methods of a three phase induction motors. (3 marks)
4. Draw the induction motor load speed characteristics. (4 marks)
5. Name six types of single phase induction motors. (3 marks)
6. Name two types of losses in transformers. (1 marks)
7. Name three types of transformer you have learnt. (3 marks)
8. Name five parts of a DC motor. (5 marks)
9. Name three types of generators. (3 marks)
10. Draw a AC waveform and on it mark  $V_{MAX}$ ,  $V_{RMS}$ ,  $V_{AVG}$ . (3 marks)

**SECTION D****CALCULATIONS****40 MARKS**

1. Three loads, each of resistance  $30\Omega$ , are connected in (a) Star and (b) Delta to a 415V, 3-phase supply. Determine  
(I) the phase voltage,  
(II) the phase current  
(III) the line current.  
(IV) the line voltage (10 marks)
2. A  $12\Omega$  resistor is connected across the secondary winding of an ideal transformer whose secondary voltage is 120V. Determine the primary voltage and the secondary current if the supply current is 4A. (5 marks)

3. A 200kVA rated transformer has a full load copper loss of 1.5kW and iron loss of 1kW. Determine the transformer efficiency at full load.  
*Note: Efficiency = Output power/ Input power* (5 marks)
4. The stator of a three phase, 4 pole induction motor is connected to a 50Hz supply. The rotor runs at 1455rpm at full load. Determine  
(a) The synchronous speed  
(b) The slip at full load (10 marks)
5. If the input for the bridge rectifier is 240Vac with 50Hz and the load resistance is 120Ω, calculate  
(a) The load voltage  
(b) The load current  
(c) The ripple voltage  
(d) The ripple frequency  
(e) The PRV/ PIV (10 marks)

**THE END OF PAPER**