CBSE | DEPARTMENT OF SKILL EDUCATION

ELECTRICAL TECHNOLOGY (SUBJECT CODE 819)

MARKING SCHEME FOR CLASS XII (SESSION 2022-2023)

Max. Time: 3 Hours **Max. Marks: 60**

General Instructions:

1. Please read the instructions carefully.
2. This Question Paper consists of **24 questions** in two sections – Section A& Section B.
3. Section A has Objective type questions whereas Section B contains Subjective type questions.
4. **Out of the given (6 + 18 =) 24 questions, a candidate has to answer (6 + 11 =) 17 questions in the allotted (maximum) time of 3 hours.**
5. All questions of a particular section must be attempted in the correct order.
6. **SECTION A - OBJECTIVE TYPE QUESTIONS (30 MARKS):**
   - **i.** This section has 06 questions.
   - **ii.** There is no negative marking.
   - **iii.** Do as per the instructions given.
   - **iv.** Marks allotted are mentioned against each question/part.
7. **SECTION B – SUBJECTIVE TYPE QUESTIONS (30 MARKS):**
   - **i.** This section contains 18 questions.
   - **ii.** A candidate has to do 11 questions.
   - **iii.** Do as per the instructions given.
   - **iv.** Marks allotted are mentioned against each question/part.

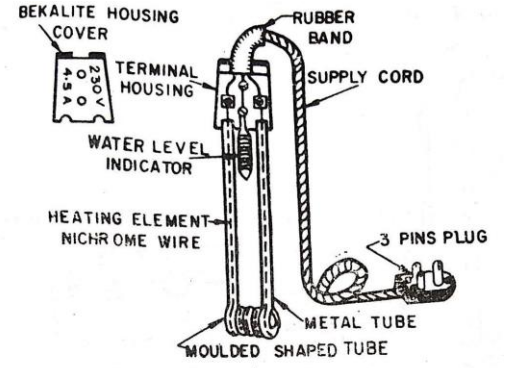
SECTION A: OBJECTIVE TYPE QUESTIONS

Q. No.	QUESTION	Source Material (NCERT/PSSCIVE / CBSE Study Material)	Unit/ Chap. No.	Page no. of source material	Marks
Q. 1	**Answer any 4 out of the given 6 questions on Employability Skills (1 x 4 = 4 marks)**				
i.	Extraversion, agreeableness, emotional stability.	Employability Skill – combined book	Self-Management	**11**	**1**
ii.	The Title Bar is located at the top of the Calc window.	Employability Skill – combined book	ICT	**15**	**1**
iii.	Confidence to do everything himself.	Employability Skill – combined book	Entrepreneurial Skill	**43**	**1**
iv.	Menu Bar, Standard Bar, Formula Bar, Name Box	Employability Skill – combined book	ICT	**15**	**1**
v.	It requires knowledge, skill and personality profile.	Employability Skill – combined book	Entrepreneurial Skill	**44**	**1**
vi.	It is defined as the drive required to engage in goal-oriented behavior.	Employability Skill – combined book	Self Management	**9**	**1**
Q. 2	**Answer any 5 out of the given 7 questions (1 x 5 = 5 marks)**				
i.	C. Both AC and DC	**CBSE Study Material**	Unit-5	80	**1**
ii.	B. Electric bell	**CBSE Study Material**	Unit-2	48	**1**
iii.	B. voltage	**CBSE Study Material**	Unit-2	48	**1**

iv.	B. Smaller	**CBSE Study Material**	Unit-4	69	**1**
v.	D. Motor will not run	**CBSE Study Material**	Unit-3	57	**1**
vi.	B. Electrolytic capacitor	**CBSE Study Material**	Unit-3	64	**1**
vii.	D. All of the above	**CBSE Study Material**	Unit-6	104	**1**
Q. 3	**Answer any 6 out of the given 7 questions (1 x 6 = 6 marks)**				
i.	50 cycles	**CBSE Study Material**	Unit-1	3	**1**
ii.	One	**CBSE Study Material**	Unit-2	47	**1**
iii.	To change AC into DC	**CBSE Study Material**	Unit-3	60	**1**
iv.	Frequency and number of poles	**CBSE Study Material**	Unit-4	58	**1**
v.	Hot wire ammeter	**CBSE Study Material**	Unit-5	86	**1**
vi.	Convection	**CBSE Study Material**	Unit-6	98	**1**
vii.	Stand on earth and touching live wire	**CBSE Study Material**	Unit-6	125	**1**
Q. No.	**QUESTION**	**Source Material (NCERT/PSSCIVE / CBSE Study Material)**	**Unit/ Chap. No.**	**Page no. of source material**	**Marks**
Q. 4	**Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)**				
i.	True	**CBSE Study Material**	Unit-3	64	**1**
ii.	True	**CBSE Study Material**	Unit-3	54	**1**
iii.	True	**CBSE Study Material**	Unit-4	68	**1**
iv.	False	**CBSE Study Material**	Unit-5	83	**1**
v.	True	**CBSE Study Material**	Unit-6	124	**1**
vi.	False	**CBSE Study Material**	Unit-6	109	**1**
Q. 5	**Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)**				
i.	KVAR	**CBSE Study Material**	Unit-1	11	**1**
ii.	ohms	**CBSE Study Material**	Unit-5	87	**1**
iii.	oil cooling	**CBSE Study Material**	Unit-2	50	**1**
iv.	Two	**CBSE Study Material**	Unit-4	57	**1**
v.	Induction	**CBSE Study Material**	Unit-6	118	**1**
vi.	parallel	**CBSE Study Material**	Unit-6	95	**1**
Q. 6	**Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)**				
i.	B. voltage	**CBSE Study Material**	Unit-2	47	**1**
ii.	B. DC series motor	**CBSE Study Material**	Unit-3	56	**1**
iii.	D. All the above	**CBSE Study Material**	Unit-6	111	**1**

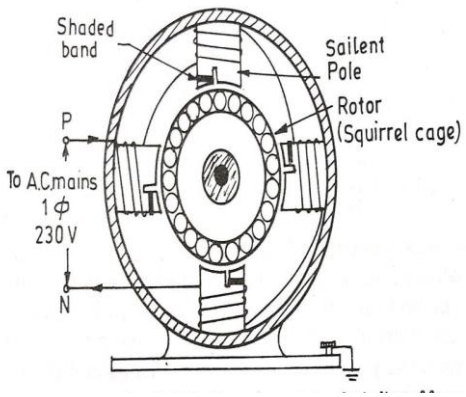
iv.	C. be four times	**CBSE Study Material**	Unit-4	67	**1**
v.	B. Moving coil meter	**CBSE Study Material**	Unit-5	92	**1**
vi.	D. Capacitor run	**CBSE Study Material**	Unit-6	121	**1**

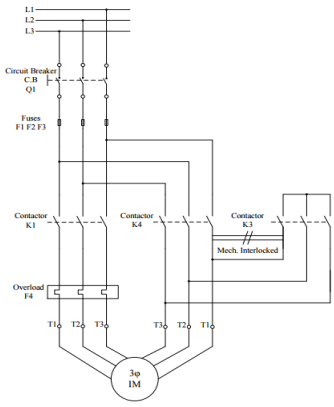
SECTION B: SUBJECTIVE TYPE QUESTIONS

Q. No.	QUESTION	Source Material (NCERT/PSSCIVE/ CBSE Study Material)	Unit/ Chap. No.	Page no. of source material	Marks
Answer any 3 out of the given 5 questions on Employability Skills in 20 – 30 words each (2 x 3 = 6 marks)					
Q. 7	Paranoid, anti-social, narcissistic, dependent	Employability Skill – combined book	Self-Management	11	**2**
Q. 8	Select save option from file menu. Type file name and choose location to save the file.	Employability Skill – combined book	ICT	17	**2**
Q. 9	Market entry regulation, shortage of capital, skilled workforce challenged, risk aversion	Employability Skill – combined book	Entrepreneurial Skill	42	**2**
Q. 10	Dream big, try new challenges, plan and execution, recognize opportunity, bounce back from failures	Employability Skill – combined book	Entrepreneurial Skill	**44**	**2**
Q. 11	Family, culture, education, society	Employability Skill – combined book	Self-Management	**13**	**2**
Answer any 3 out of the given 5 questions in 20 – 30 words each (2 x 3 = 6 marks)					
Q. 12		**CBSE Study Material**	Unit-6	**94**	**2**
Q. 13	Supply cut off: examine the supply Brush is not in contact: clean commutator Open circuit: test it with test lamp	**CBSE Study Material**	Unit-3	**55**	**2**
Q. 14	Electricity, even at small voltages (110V) can cause severe injury or death by causing a person's heart or lungs to stop working. If a co-worker has come into contact with electricity they may not be able to remove themselves from the electrical source. DO NOT ATTEMPT TO PULL THE PERSON FROM THE ELECTRICAL SOURCE WITH YOUR BARE HANDS, YOU MAY BE ELECTROCUTED. Remember, your body is a good conductor of electricity, if you touch the person while they are connected to the electrical source, the electricity will flow through your body causing electrical shock. You should first attempt to turn off the source of the electricity (disconnect). If you cannot locate the electrical isolating source, you can	**CBSE Study Material**	Unit-6	**125**	**2**

	use a non-conducting object, such as a wooden pole, to remove the person from the electrical source. Emergency medical services should be called as soon as possible.				
Q. 15	**TYPES OF TRANSFORMER** 1. Step-up transformer 2. Step-down transformer 3. Voltage transformer 4. Current transformer 5. Auto transformer	**CBSE Study Material**	Unit-2	**46**	**2**
Q. 16	Increase in copper losses, overload, cost increase, great voltage regulation	**CBSE Study Material**	Unit-1	**11**	**2**
Answer any 2 out of the given 3 questions in 30– 50 words each (3 x 2 = 6 marks)					
Q. 17	**Universal Motors** These motors are exactly same as D.C. series motors. They can be operated both on A.C. (Single Phase) and D.C supply. In these motors, the field and the armature are connected in series with each other. For changing the directions of rotation either armature or field connections are changed. The principle of this motor is the same as that of D.C series motor. The speed of universal motor is inversely proportional to the load i.e. at high load, its speed is low but at small load, its speed is high. The torque of this motor is directly proportional to the current taken by the motor. The motor is started on putting the load. The starting device used with this type of motor is auto-transformer with the help of which the voltage is raised on the motor gradually so that the motor is saved from high starting current. **Applications** These motors are used for household appliances such as table fan, vacuum cleaner, hair drier, sewing machine and small electric drill machine etc.	**CBSE Study Material**	Unit-3	**108**	**3**
Q. 18	**AUTO TRANSFORMER** - it is a one winding transformer. This winding is used to provide primary and secondary winding turns and these two are not electrically isolated as in normal 2 winding transformer. The transformation ratio of auto transformer is near to Unity for the same voltage ratio and capacity, the auto Transformer require less amount of copper. The auto transformer may be step up or step down transformer. If the number of primary turns is N1 and Number of secondary turns is N2 and K is transformation ratio then (N1/N2) = K. If N1 is greater than	**CBSE Study Material**	Unit-1	**49**	**3**

<table>
<tr><td></td><td>N2, so the auto transformer is a step down transformer, otherwise it is step up transformer. In auto transformer power is transferred through two modes ie. Inductively and conductivity. Copper is saved in auto transformer because auto transformer has only one winding so it consumes less amount of copper. The volume of copper depends upon the area of cross section and length of conductor.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Q. 19</td><td>Room Cooler
It is used to supply cool air in the hot season. The room cooler consists for two speed capacitor start or capacitor run type motor having extended shaft on both sides. The motor is fitted vertically in the water tank of room cooler. On the top of motor shaft, a air blower is fitted which throws cool air through grill provided in the front of room cooler after sucking from outside through khas-has matting and on the bottom of motor shaft a small water pump is tithed which pump sweater from water tank OT distributing channel fitted on the top of ‘wood wool pads’ or ‘khas-khas matting’. The water from the holes of distributing channel drops on the khas-khas matting and keep it moistened from top to bottom that is why the cool air can be changed according to the choice by the help of guide vanes which are provided on the front chase of the cooler. The speed of the motor or blower can be controlled by the select switch fitted in the front panel of cooler. When switch knob is kept on ‘Hi’ position, whole of the voltage is applied across running winding and capacitor gets nearly double supply voltage due to transformer action of the auxiliary winding along with running winding and high action of the auxiliary winding along with running winding and high speed of the motor is obtained and we get more cool air from the blower. When the switch knob is kept on ‘LO’ position, voltage across the running winding is reduced which reduces the speed of the motor and blower throws less cool air out of the grill. The water level of the water in the wait tank of the panel which indicates the level of the water in the water tank of the cooler.</td><td>CBSE Study Material</td><td>Unit-6</td><td>104</td><td>3</td></tr>
<tr><td colspan="6">Answer any 3 out of the given 5 questions in 50– 80 words each (4 x 3 = 12 marks)</td></tr>
<tr><td>Q. 20</td><td>Application of different types of DC Motors
<table><tr><th>Types & characteristics of motor</th><th>Applications</th></tr><tr><td>1 - Shunt motor: its speed is approx. remain constant and has medium starting torque.</td><td>1- lathe and drill machine
2- milling and shaper machine
3- blowers and fans
4- spinning and weaving machine in textile industry
5- machine tools</td></tr></table></td><td>CBSE Study Material</td><td>Unit-3</td><td>58</td><td>4</td></tr>
</table>

		2- Series motor: it has high starting torque and variable speed is required	1- Elevators 2- electric traction 3- Hoist and cranes 4- trolley and conveyor belt system 5- air compressor 6- vacuum cleaner, hair dryer sewing machine				
		3- Compound motor (i) Commulative compound motor it has high starting torque no load connection is permissible (ii) differential compound motor its speed increases as load decreases	1- Rolling Mills 2- punch machine 3- Presses 4- heavy planners 5- shear machine 6- reciprocating machine generally this type of motor is not used				
Q. 21		**Shaded Pole Motor.** This motor consists of salient poles on the stator and squirrel cage rotor. The motor is made self starting by making a one third cut in each of the laminated pole and the cut is short circuited with a copper ring which is known as shaded pole and so the motor is called shaded pole motor. The shaded poles are independent of the stator winding and have no connection with the winding. When the alternating current is sent through the winding surrounding the whole pole, the axis of the pole is shifted from the un-shaded part to the shaded part which results the rotation of the rotor and the motor works as a self starting motor. These motors are made from 1/25 H.P. to 1/6 H.P. They are simple in construction and cheap but have very low starting torque, low efficiency and low overload capacity. Its efficiency varies from 5 to 35%. These motors are used for clocks, phonographs, hair driers, small fans, record players, ventilators, circulators, toys, instruments, projectors and advertising displays etc.  	**CBSE Study Material**	Unit-6	**111**	**4**
Q. 22		An AC current is applied in the stator armature which generates a flux in the stator magnetic circuit. This flux induces an emf in the conducting bars of rotor as they are "cut" by the flux while the magnet is being moved (E = BVL (Faraday's Law)) A current flows in the rotor circuit due to the induced emf, which in term produces a force,	**CBSE Study Material**	Unit-4	**67**	**4**

	(F = BIL) can be changed to the torque as the output. In a 3-phase induction motor, the three-phase currents ia, ib and ic, each of equal magnitude, but differing in phase by 120°. Each phase current produces a magnetic flux and there is physical 120 °shift between each flux. The total flux in the machine is the sum of the three fluxes. The summation of the three ac fluxes results in a rotating flux, which turns with constant speed and has constant amplitude. Such a magnetic flux produced by balanced three phase currents flowing in three-phase windings is called a rotating magnetic flux or rotating magnetic field (RMF).RMF rotates with a constant speed (Synchronous Speed). Existence of a RFM is an essential condition for the operation of an induction motor. If stator is energized by an ac current, RMF is generated due to the applied current to the stator winding. This flux produces magnetic field and the field revolves in the air gap between stator and rotor. So, the magnetic field induces a voltage in the short circuited bars of the rotor. This voltage drives current through the bars. The interaction of the rotating flux and the rotor current generates a force that drives the motor and a torque is developed consequently. The torque is proportional with the flux density and the rotor bar current (F=BLI). The motor speed is less than the synchronous speed. The direction of the rotation of the rotor is the same as the direction of the rotation of the revolving magnetic field in the air gap. However, for these currents to be induced, the speed of the physical rotor and the speed of the rotating magnetic field in the stator must be different, or else the magnetic field will not be moving relative to the rotor conductors and no currents will be induced. If by some chance this happens, the rotor typically slows slightly until a current is re induced and then the rotor continues as before. This difference between the speed of the rotor and speed of the rotating magnetic field in the stator is called slip. It is unit less and is the ratio between the relative speed of the magnetic field as seen by the rotor the (slip speed) to the speed of the rotating stator field. Due to this an induction motor is sometimes referred to as an asynchronous machine. Parts are Stator, Rotor, bearing, fan, dust cover, end cover etc				
Q. 23	***Star-Delta Motor Starter*** The Star Delta starting method is a motor starting mechanism that minimizes the large amount of starting current that motors draw in. The Star Delta, as the name suggests basically involves feeding the motor with 1/√3 (58%) of the full load current until it attains speed then applying the full load current. It is required three contactors i.e., the Star Contactor (K3), the Delta Contactor (K4) and the Main Contactor (K1). However for the motor to be started in Star Delta, its internal connection at the terminal box has to be wired in Delta-giving it capability of receiving the full-load current at any instant. When the power is fed into the 	**CBSE Study Material**	Unit-5	**74**	**4**

	circuit, K1 allows current to flow to the motor. Current flows into the motor and out to the K3 which is the star-connected starter. After a specified period defined by the clock delay (usually 5 sec) the K4 (Delta) Closes and K3 opens to allow the motor to receive the full load current and run at delta. Traditionally, in many regions there was a requirement that all motor connections be fitted with a reduced voltage starter for motors greater than 4KW (5HP).This was to curb the high inrush of starting currents associated with starting induction motors. The star and delta contactors are mechanically interlocked i.e., if one of them is closed the other cannot close. This is done to avoid dead short circuit in case both the contactors closing simultaneously. Electrical interlocking has also been provided, by using contactors control contacts. An advantage of this method could be low or reduced cost as compared to other methods.				
Q. 24	**Electric Geysers (Water Heater)** To get the hot water, either continuously or intermittently, an electric water heater is more useful device. It can be easily installed anywhere with the electric power. Its water temperature can easily be regulated automatically by a thermostat. It works on the principle of thermal storage i.e. the water is preheated by immersion water in a storage vessel and is kept for future use. To get the water in a storage vessel and is kept for future use. To get the hot water from time to time, the storing vessel is provided with thick insulation or it is properly legged to dissipate the heat. The heating element is fixed at the bottom horizontally or vertically. As the water heater is switched 'on' the cold water is heated up, becomes lighter and starts moving up while the cold water being heavier comes down. Thus due to this circulation of water, we can get hot water from the outlet valve. If the element is fixed horizontally, the water above it, is heated very slowly but when the element is fixed vertically, the water surrounding this is heated up very soon. So the vertical fitting of the element in the water heater is more referred. Water heater may be classified in the following ways: **(a) Immersion Heater or Rod.** It can be put in any vessel full of water and by switching on, the water is heated up. It is a portable and cheap and has been described before. **(b) Self-contained Heaters.** These are of two types: (1) Non-Pressure type (II) Pressure type These consist of a storage vessel, heavily legged, electrically heated and provided with a thermostat system. (a) **Non-pressure Type Water Heater.** This type of water heater is used at that place where the hot water is required only at one service point e.g. for wash-basins and sinks etc. Such water heaters have an open outlet i.e. not having any stop-cock. Its water is controlled from the inlet side. These contain two cylindrical vessels, one fitted inside the outer. The inner vessel consists of heating chamber made of tinned copper. Inside it, the heating element and thermostat are fixed vertically at the bottom. The outer vessel is made of lead-coated-steel and painter outside with enamel paint. The space between the two	**CBSE Study Material**	Unit-6	**98**	**4**

	vessels is filled with heat resisting insulating material to reduce heat loss. The temperature of the water is controlled automatically with thermostat. The inlet and outlet pipes are chromium plated to avoid corrosion. The cold water flows from the cold water supply pipe (inlet pipe) and enters in the heating chamber and is controlled by a valve. The hot water flows out from the top of the heating chamber through the hot water pipe (outlet pipe). An anti drip device is provided with the hot water pipe to cut off the quick hot water supply and to prevent the water to be drained off through the cold water pipe valve when the supply of cold water fails. As the hot water pipe is an open outlet, when the cold water inlet valve is opened, the cold water rushes into the heating chamber, displaces and forces out an equal quantity of hot water through the hot water outlet pipe. To save the water heater from the developed pressure inside the heating chamber, a vent plug is fitted at the top which allows extra pressure in atmosphere. The wattage of this water heater is about 750 to 2000 W etc. (ii) **Pressure Type Water Heater.** In other words it is called cistern type water heater as it works on atmospheric pressure. This type of water heater is used at that place where the hot water is required at more than one service points with one heater only. This heater gets its supply of cold water from the cistern (over head tank) connected with the water mains and the water controlled with the help of a float valve. The copper pipes connected with the heating chamber are used to supply the hot water under pressure to different service points which are controlled with a tap. The element and thermostat are fixed at the removable plate fitted on the base of the water heater for their easy service and to remove them easily. The water is of 750 to 3000 W. These are of two types: **(i) Constant volume pressure type water heater.** In this water heater, the hot water drained off is replaced equally with cold water having equal volume. So it is called a constant pressure type water heater **(ii) Non-constant volume pressure type water heater.** In this water heater, the rate at which the hot water flows out is not the same at which the cold water enters into the heating chamber. So it is known as non-constant or varying volume pressure type water heater.				