BIRLA INSTITUTE OF TECHNOLOGY
MESRA – 835215, RANCHI, INDIA

UG

Name: …………………………………………………. Roll No.: …………………………………………..

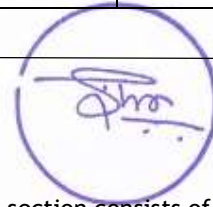Branch: …………………………………………………. Signature of Invigilator: ……………………

Semester: VIth   Date: 02/05/2022 (MORNING)

Subject with Code: **EE443 UTILIZATION OF ELECTRICAL POWER**

Marks Obtained	Section A (30)	Section B (20)	Total Marks (50)

INSTRUCTION TO CANDIDATE

1. The booklet (question paper cum answer sheet) consists of two sections. First section consists of MCQs of 30 marks. Candidates may mark the correct answer in the space provided / may also write answers in the answer sheet provided. The Second section of question paper consists of subjective questions of 20 marks. The candidates may write the answers for these questions in the answer sheets provided with the question booklet.

2. The booklet will be distributed to the candidates before 05 minutes of the examination. **Candidates should write their roll no. in each page of the booklet.**

3. Place the Student ID card, Registration Slip and No Dues Clearance (if applicable) on your desk. All the entries on the cover page must be filled at the specified space.

4. Carrying or using of mobile phone / any electronic gadgets (except regular scientific calculator)/chits are strictly prohibited inside the examination hall as it comes under the category of unfair means.

5. No candidate should be allowed to enter the examination hall later than 10 minutes after the commencement of examination. Candidates are not allowed to go out of the examination hall/room during the first 30 minutes and last 10 minutes of the examination.

6. Write on both side of the leaf and use pens with same ink.

7. The medium of examination is English. Answer book written in language other than English is liable to be rejected.

8. All attached sheets such as graph papers, drawing sheets etc. should be properly folded to the size of the answer book and tagged with the answer book by the candidate at least 05 minutes before the end of examination.

9. The door of examination hall will be closed 10 minutes before the end of examination. Do not leave the examination hall until the invigilators instruct you to do so.

10. Always maintain the highest level of integrity. Remember you are a BITian.

11. Candidates need to **submit the question paper cum answer sheets before leaving the examination hall**.

CLASS:BTECH   SEMESTER : VI
BRANCH: EEE   SESSION : SP/22

SUBJECT: EE443 UTILIZATION OF ELECTRICAL POWER

TIME: 2 HRS.   FULL MARKS: 50

INSTRUCTIONS:
1. **The question paper contains 35 questions of total 50 marks. Questions 1 to 30 are MCQ of 1 mark each and questions 31 to 35 are subjective of 4 marks each.**
2. **The missing data, if any, may be assumed suitably.**
3. **Before attempting the question paper, be sure that you have got the correct question paper.**

Q.1   The coefficient of adhesion is highest when (a) the rails are dusty (b) the rails are wet (c) the rails are dry (d) the rails are oiled

Q.2   Two locomotives having identical tractive-effort-slip characteristics haul a heavy train. The loco with larger diameter shares (a) larger tractive effort (b) smaller tractive effort (c) equal tractive effort.

Q.3   The distance between two stations is 1 Km and the average and scheduled speeds of the train are 36 Kmph and 30 Kmph respectively. The stations stopping time is (a) 20 sec (b) 40 sec (c) 10 sec (d) 16 sec

Q.4   Composite braking consists of (a) Regenerative braking only (b) Dynamic braking only (c) Both regenerative and dynamic braking (d) Only plugging

Q.5   Quadrilateral speed time curve is used for (a) sub-urban service (b) urban service (c) main line service (d) urban and sub-urban service

Q.6   The _____ braking is inherent in PWM VSI (a) regenerative (b) composite (c) dynamic (d) none of these

Q.7   In PWM VSI induction motor drive, the IM can be connected in (a) parallel (b) series (c) Only one inverter can control only one IM (d) it can be connected in series and parallel.

Q.8   A train having inertial weight of 220 tonnes uses regenerative braking when the speed is changed from 60 kmph to 20 kmph. The electric energy returned to supply is (assume 100 percent efficiency) (a) 7.546 KWhr (b) 8.32 KWhr (c) 5.6595 KWhr (d) None of the above

Q.9   A 100 tonnes locomotive is employed to drive a train weighing 500 tonnes. The effect of rotating inertia is to make the effective mass higher by 10%. The locomotive has 4 dc motors, each geared to the driving axle through a reduction gear with a = 0.25. Transmission system efficiency is 95%. Each wheel has a radius of 0.54 m. Train resistance is 30 N/tonne . The coupling torque per motor required to accelerate the train at 2 kmphps on a level track is (a) 11234.7 N-m (b) 13666.8 N-m (c) 12437. 6 N-m (d) none of the above

Q.10   An electric train has acceleration and deceleration of 5 kmphps between two stations at 15 km apart. Assuming a trapezoidal speed-time curve, the speed during free running if the running time of the train is 6 min (a) 178.15 kmph (b) 138.32 kmph (c) 165.15 kmph (d) none of the above.

Q.11   Induction heating is used for (a) Insulating materials (b) Magnetic materials (c) Non-magnetic materials (conducting) (d) Both magnetic and non-magnetic conducting materials

Q.12   The main application of indirect arc furnace is to melt: (a) steel (b) iron (c) non-ferrous metals

Q.13   For heating magnetic materials, using induction heating, the hysteresis and eddy current losses are respectively proportional to (a) f and f^2 (b) f^2 and f (c) f and f (d) none of the above

Q.14   The core type furnace is usually operated at (a) 10 Hz (b) 50 Hz (c) 500 Hz (d) 5 KHz

Q.15   In case of seam welding, the flow of current through the electrode should be (a) continuous (b) intermittent (c) can be continuous or intermittent

Q.16   The heating method which has maximum power factor is (a) Arc heating (b) Resistance heating (c) Induction heating (d) Dielectric heating

Q.17   The heating method used for heating non conducting materials is (a) Eddy current heating (b) Arc heating (c) Dielectric heating (d) Induction heating

Q.18   A piece of an insulating material is to be heated by dielectric heating. The size of the piece is 10 x 10 x 3 cm^3. A frequency of 20 MHz is used and the power absorbed is 400 Watts. The material has a permittivity of 5 and a p. f. of 0.05. The voltage necessary for heating is (a) 1056 V (b) 2076 V (c) 2346 V (d) none of the above

Q.19   Which of the following lamps gives nearly monochromatic light (a) Fluorescent tube (b) sodium vapour lamp (c) Mercury vapour lamp (d) GLS lamp

Q.20   A fluorescent tube normally used on a.c. circuit is used on d.c. The additional feature required for operation is (a) a capacitor in series with choke (b) a resistance across the choke (c) a resistance in series with the choke (d) none of the above.

Q.21   The visual region of light extends between (a) 5000 A° to 7500 A° (b) 400 A° to 750 A° (c) 0.4 micron to 0.75 micron (d) none of the above

Q.22   A lamp gives 1500 c.p. in all directions below the horizontal. The total radiation sent vertically downward is (a) 750 π (b) 1500 π (c) 750/π (d) 1500/π

Q.23   The safe working temperature of a tungsten filament lamp is (a) 1000ºC (b) 2000ºC (c)1500ºC (d) 3000ºC

Q.24   A room measuring 20 m x 15 metres is to be illuminated by 10 lamps and the average illumination is to be 75 lux. Determine the MSCP of each lamp if the utilization and depreciation factors are 0.5 and 0.8 respectively (a) 317.85 lux (b) 356.74 lux (c) 447.85 lux (d) none of the above

Q.25   In a street lighting scheme, lamps with candle power of 500 are hung at a height of 5 metres. The distance between the posts is 10 metres. The illumination at the midpoint between the posts is (a) 11.32 lux (b) 16.14 lux (c) 14.14 lux (d) none of the above

Q.26   The CPU module in the PLC is used to (a) control the outputs only (b) execute the control program only (c) read inputs only (d) read inputs, execute the control program, and update output

Q.27   In a PLC, which of the following is NOT a subpart of Central Processing Unit (CPU) (a) programmer (b) microprocessor (c) memory (d) power supply

Q.28   Decide whether each of these statements is True (T) or False (F).
The instruction list:
OUT Y430
ANI X402
LDI X401
describes a ladder diagram rung for which there is an output when:
(i) Input X401 is activated but X402 is not.
(ii) Input X401 and input X402 are both activated.
(a) (i) T (ii) T   (b) (i) T (ii) F   (c) (i) F (ii) T   (d) (i) F (ii) F

Q.29 Decide whether each of these statements is True (T) or False (F).
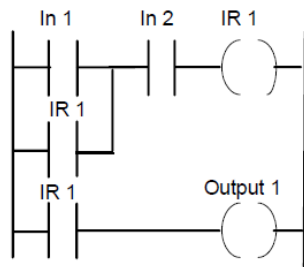
The instruction list:
OUT Y430
ANI X402
OR Y430
LD X401
describes a ladder diagram rung for which there is:
(i) An output when input X401 is momentarily activated.
(ii) No output when X402 is activated
(a) (i) T (ii) T   (b) (i) T (ii) F   (c) (i) F (ii) T   (d) (i) F (ii) F

Q.30 Decide whether each of these statements is True (T) or False (F).
For the ladder diagram shown in Figure , there is an output from output 1 when:

(i) There is an input to In 2 and a momentary input to In 1.
(ii) There is an input to In 1 or an input to In 2.
(a) (i) T (ii) T   (b) (i) T (ii) F (c) (i) F (ii) T (d) (i) F (ii) F

Q.31 Obtain the expression for specific energy consumption on a level track for an electric train.
Q.32 What are the important features of load commutated inverter fed synchronous motor dc traction drive. Draw its circuit diagram and explain. Why the coefficient of adhesion is not as good as in voltage source inverter induction motor drive.

OR

Describe a chopper controlled dc traction drive with composite braking. How it is ensured to minimise energy dissipation in dynamic braking.
Q.33 With neat sketches, describe the construction, principle of operation, application and control methods of a direct arc furnace.

OR

Describe the construction and principle of operation and application of a fluorescent lamp.
Q.34 Draw the ladder diagram for single cycle operation of a machine using a CAM operated limit switch and explain its operation.
Q.35 Explain the auxiliary contact interlocking method for forward and reverse operation of an induction motor. Draw the control circuit.

:::::02/05/2022:::::