

6. (a) Illustrate the comparison between magnetic and electric circuit. 7.5
- (b) Calculate the relative permeability of an iron when the exciting current taken by 700 turns coil is 1.5 A and the total flux produced is 2 mWb. The mean circumference of the ring is 0.6 m and the area of cross-section is 12 cm². 7.5

Section D

7. (a) A single phase step up transformer of 110 kVA, 50 Hz, 400 V/11000 V rating has an efficiency of 98% when supplying full load current of 0.85 power factor lagging and an efficiency of 99% when supplying half of the full load current at unity power factor. Find the core losses and copper losses corresponding to the full load current. 7.5
- (b) What is auto transformer ? What are their advantages and disadvantages as compared to two-winding transformers ? 7.5
8. (a) For a speed control of the DC motors, flux control method is preferred over armature control method. Why ? 7.5

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B. Tech. EXAMINATION, 2021

Semester I (CBCS)

PRINCIPLES OF ELECTRICAL ENGINEERING

EE-101

Time : 2 Hours

Maximum Marks : 60

The candidates shall limit their answers precisely within 20 pages only (A4 size sheets/assignment sheets), no extra sheet allowed. The candidates should write only on one side of the page and the back side of the page should remain blank. Only blue ball pen is admissible.

Note : Attempt *Four* questions in all, selecting *one* question from any of the Sections A, B, C and D. Q. No. 9 is compulsory.

Section A

1. (a) Discuss various factors affecting selection of site for a hydroelectric power plant. Explain the function of penstock and surge tank. 7.5

- (b) What are the advantages and limitations of nuclear power plants ? **7.5**
2. (a) State and explain Norton's theorem. List the steps for obtaining Norton's equivalent circuit. **7.5**
- (b) A coil of 5Ω resistance is connected in parallel with a coil of $R_1 \Omega$ resistance. This combination is then connected in series with an unknown resistor of $R_2 \Omega$ and the complete circuit is then connected to 50 V dc supply. Calculate the values of R_1 and R_2 resistance if power dissipated by unknown resistor R_2 is 150 W with 5 A passing through it. **7.5**

Section B

3. (a) Develop the expression for the mean power consumed over a cycle of a single-phase sinusoidal supply delivering power to a load comprising a resistance R in series with an inductance L . **7.5**
- (b) A parallel circuit has two branches. One branch contains a resistance of 6Ω and inductance of 15 mH in series and the other contains a

resistance of 5Ω and capacitor of capacitance $500 \mu\text{F}$ in series. This parallel circuit is connected across a supply voltage of 230 V, 50 Hz. Determine the (i) current drawn by each branch, (ii) total current drawn from the mains, and (iii) power factor of the whole. **7.5**

4. (a) How is the power measured by the two watt meters in a three-phase balanced load ? Explain with a neat circuit and phasor diagram. **7.5**
- (b) Write down the relationship between line voltage and line current with phase voltage and phase current in star connected and delta connected circuits. **7.5**

Section C

5. (a) Describe the constructional detail and principle of operation of a single-phase energy meter with a neat sketch. **7.5**
- (b) A moving coil ammeter whose reading is up to 1 A has a resistance of 0.02Ω . How could this instrument be adopted to read (i) a voltage up to 300 V and (ii) a current up to 100 A ? **7.5**

- (b) Explain the principle of operation of a synchronous motor. 7.5

(Compulsory Question)

9. (a) Explain the concept of source transformation with suitable example.
- (b) What are the advantages of three-phase system over the single-phase system ?
- (c) Explain Ampere's circular law.
- (d) Explain the working of a single-phase capacitor start induction motor.
- (e) Derive the emf equation of a DC generator.

5×3=15