| U.S.N. | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|

# B.M.S. College of Engineering, Bengaluru-560019

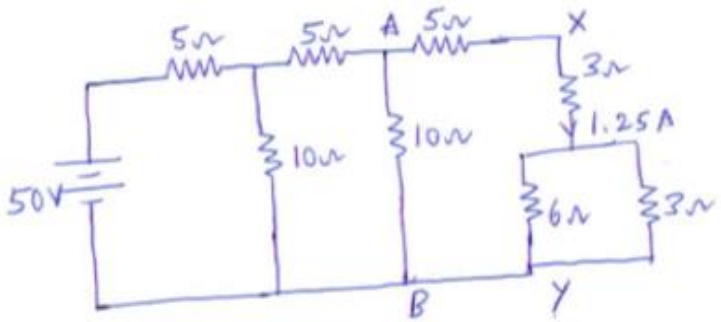
**Autonomous Institute Affiliated to VTU**

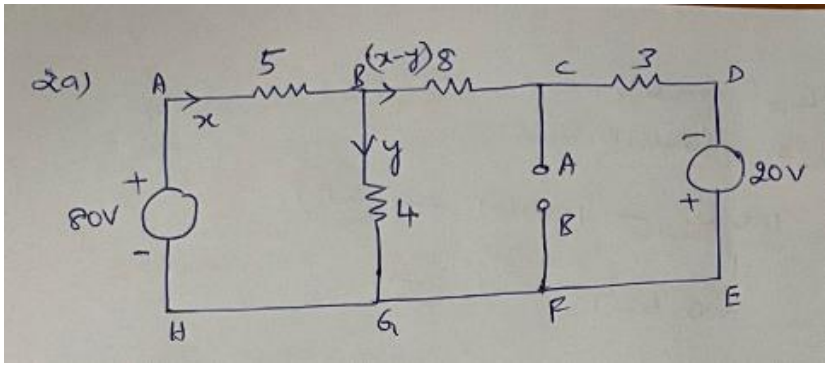
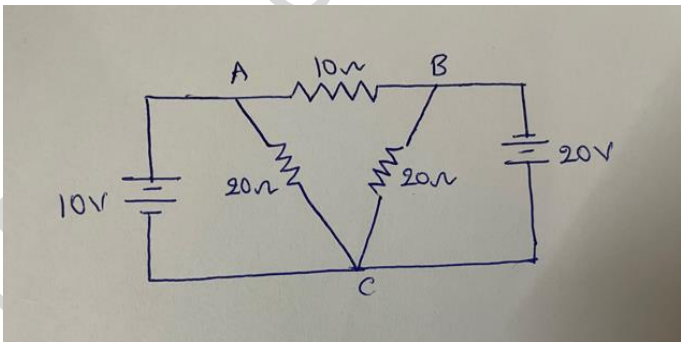
## February / March 2025 Semester End Main Examinations

**Programme: B.E.** **Semester: I / II**
**Branch: Common to all Branches** **Duration: 3 hrs.**
**Course Code: 22EE1ESIEE / 22EE2ESIEE** **Max Marks: 100**
**Course: Introduction to Electrical Engineering**

**Instructions**: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

**Important Note:** Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

| | | UNIT - I | *CO* | *PO* | Marks |
|---|---|---|---|---|---|
| 1 | a) | Differentiate between conventional and non-conventional energy sources. | *CO1* | *PO1* | **05** |
| | b) | With a neat diagram explain different components of a solar power plant. | *CO1* | *PO1* | **06** |
| | c) | Two batteries A and B are connected in parallel to supply a common load of 0.3 Ohm. The open circuit emf of A is 11.7 V and that of B is 12.3 V. The internal resistances are 0.06 Ohm and 0.05 Ohms respectively. Find i) the current supplied by each battery ii) load current iii) Terminal voltage. | *CO1* | *PO1* | **09** |
| | | **OR** | | | |
| 2 | a) | Explain with a neat diagram, the working of a wind power plant. | | | **07** |
| | b) | Explain the general structure of a power system with the help of single line diagram. | | | **06** |
| | c) | Determine the current supplied by the source and voltage across 6 Ohm resistor. Also determine the equivalent resistance across the source terminals.   Fig 2c) | | | **07** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | **UNIT - II** | | | |
| | 3 | a) | Obtain Thevenin's equivalent circuit at AB for the network shown in Fig. 2a. All resistances are in Ohms.<br>  <br><br>Fig. 2a | *CO2* | *PO2* | **08** |
| | | b) | Derive the expression for co-efficient of coupling. | *CO1* | *PO1* | **06** |
| | | c) | Two coils A and B have self-inductances of 120 μH and 300 μH respectively. A current of 1A through coil A produces flux linkages of 100 μWb turns in coil B. Calculate i) mutual inductance between the coils ii) the coupling coefficient iii) average EMF induced in coil B if a current of 1A in coil A is reversed at a uniform rate in 0.1 sec. | *CO2* | *PO2* | **06** |
| | | | **OR** | | | |
| | 4 | a) | Apply Superposition theorem and determine the current through the 10 Ohm resistor for the network shown. Also find the voltage across 10 Ohm resistor.<br>  <br><br>Fig.3a | *CO2* | *PO2* | **08** |
| | | b) | Explain the concept of self and mutually induced EMF. | *CO1* | *PO1* | **06** |
| | | c) | Two coils A of 12500 turns and B of 16000 turns lie in parallel so that 60% of flux produced in A links coil B. A current of 5 A in A produces a flux of 0.6 mWb, while the same in B produces 0.8 mWb. Determine i) mutual inductance ii) coupling co-efficient iii) energy stored in both inductors. | *CO2* | *PO2* | **06** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | **UNIT - III** | | | |
| | 5 | a) | Define the following with respect to an alternating current with appropriate expressions.<br>(i)Average value (ii) Time period (iii) form factor (v) peak factor | *CO2* | *PO2* | **08** |
| | | b) | Discuss the relation between current and voltage in a RC series circuit. Write the necessary circuit and waveforms. | *CO2* | *PO2* | **06** |
| | | c) | In a RLC series circuit, what will be the nature of current for the following cases? Discuss with relevant equations and phasor diagram.<br>i) capacitive reactance is same as inductive reactance<br>ii) inductive reactance is greater than capacitive reactance | *CO2* | *PO2* | **06** |
| | | | **OR** | | | |
| | 6 | a) | Define the following with respect to an alternating current with appropriate expressions.<br>(i)RMS value (ii) peak value (iii) time period (iv) frequency | *CO2* | *PO2* | **08** |
| | | b) | Discuss the relation between current and voltage in a RL series circuit. Write the necessary circuit and waveforms. | *CO2* | *PO2* | **06** |
| | | c) | Explain the behaviour of pure Resistor, Inductor and pure Capacitor connected to single phase AC circuit. | *CO2* | *PO2* | **06** |
| | | | **UNIT - IV** | | | |
| | 7 | a) | A 40 kVA single phase transformer has a core loss of 450 W and full load copper loss of 900 W. If the power factor of the load is 0.8, Calculate i) Full load efficiency ii) Load corresponding to maximum efficiency iii) Maximum efficiency at unity pf. | *CO2* | *PO2* | **08** |
| | | b) | Derive an expression for EMF equation of a transformer. | *CO1* | *PO1* | **05** |
| | | c) | A 120 V DC shunt motor has an armature resistance of 0.2 Ohm and field resistance of 60 Ohm. The full load line current is 60 A and full load speed is 1800 rpm. If brush contact drop is 3V, find the speed of the motor at half of its full load. | *CO2* | *PO2* | **07** |
| | | | **OR** | | | |
| | 8 | a) | Derive the voltage and current expressions for DC shunt and series motors with respective circuit diagrams. | *CO2* | *PO2* | **08** |
| | | b) | A 4 pole DC shunt motor takes 22 A from 200 V supply. The armature and the field resistances are 0.5 Ohm and 100 Ohm respectively. The armature is lap connected with 300 conductors. If flux per pole is 20 mWb, calculate the speed and the gross torque (Ta). | *CO2* | *PO2* | **06** |
| | | c) | Derive the condition for maximum efficiency in a transformer. Hence find the expression for maximum efficiency and the load corresponding to maximum efficiency. | *CO2* | *PO2* | **06** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | **UNIT - V** | | | |
| | 9 | a) | The power load in a house is as follows:<br>6 lamps of 60W each for 6 hours<br>3 fans of 70W each for 4 hours<br>1 refrigerator of 200W for 1 hour<br>1 mixer of 400W for 1 hour<br>Geiser of 1kW for 1 hour<br>Calculate the energy consumed in a day and total energy consumed per month. If the first 100 units are free and for the remaining it is charged at the rate of Rs 7.10/-. Calculate the tariff assuming a fixed charge of Rs.600/- for 5 kW sanctioned capacity for the house and 30 days in a month. | *CO3* | *PO6* | **08** |
| | | b) | What is fuse? Define fusing current and rated current of a fuse? | *CO3* | *PO6* | **05** |
| | | c) | With a neat diagram explain plate earthing. | *CO3* | *PO6* | **07** |
| | | | **OR** | | | |
| | 10 | a) | Explain the working of an Electric vehicle with a neat block diagram. | CO1 | PO1 | **07** |
| | | b) | Compare the functioning of fuse and MCB. | *CO3* | *PO6* | **05** |
| | | c) | Why earthing is necessary? Explain pipe earthing. | *CO3* | *PO6* | **08** |

**********