BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH **SEMESTER : I**
BRANCH: CEP&P/BT/CHEM. ENGG./CIVIL/MECH/PROD **SESSION : MO/18**

SUBJECT: EE101 BASICS OF ELECTRICAL ENGINEERING

TIME: 3:00 HRS. **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) Determine (i) the current I (ii) voltage across 5Ω resistor (iii) the power loss in 18 Ω resistor in the circuit shown in Fig-1. [5]

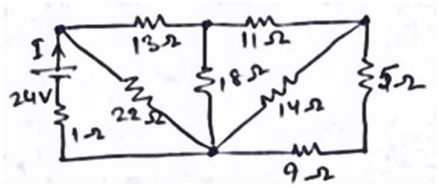

FIG.1

Q.1(b) A magnetic core, in the form of a closed ring, has a mean length of 25cm and a cross-section of 1cm^2. The relative permeability of iron is 2200. What direct current will be needed in a coil of 2000 turns uniformly wound round the ring to create a flux of 0.2mWb in the iron? [5]
If an airgap of 1mm is cut through the core perpendicular to the direction of this flux, what current will now be needed to maintain the small flux in this gap? What fraction of total ampere-turns is required to maintain the same flux in the airgap? Also draw the electrical equivalent of the magnetic circuit.

Q.2(a) Define power factor. Draw the power triangle and show the phase angle on that. Explain the use of capacitors for power factor improvement. [5]

Q.2(b) A sinusoidal 50Hz voltage of 200V supplies the three parallel branches as shown in the Fig-2. Find the current in each circuit and the total current. Also draw the phasor diagram. [5]

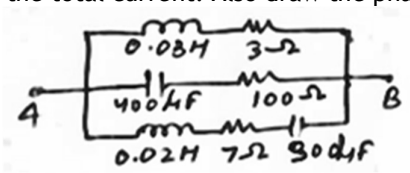

FIG.2

Q.3(a) Derive for both star and delta connected system, an expression for the total power input for a balanced three-phase load in terms of line voltage, line current and power factor. [5]

Q.3(b) The three arms of a three-phase load each comprise of an inductor of resistance 25Ω and of inductance 0.15H in series with a 120μF capacitor. The supply is 415V, 50Hz. Calculate the line current and the total power in watts, when the three arms are connected in (i) Star (ii) Delta. Draw the phasor diagram in both cases. [5]

Q.4(a) State and prove maximum power transfer theorem for AC circuits. [5]

Q.4(b) Determine the voltage across 2Ω resistor for the circuit shown in Fig-3 using Norton's theorem. [5]

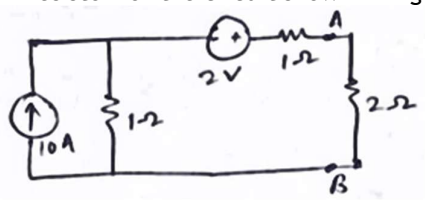

FIG.3

Q.5(a) Explain with the help of suitable diagrams the working principle of [5]
(i) Motor (ii) AC generator.

Q.5(b) With the help of suitable diagram, explain the working principle of any one digital voltmeter. [5]

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