

**B.Tech. MECHANICAL ENGINEERING
(COMPUTER INTEGRATED
MANUFACTURING) /**

B.Tech. (AEROSPACE ENGINEERING) (BTAE)

Term-End Examination

01253

December, 2016

**BME-021 : PRINCIPLES OF ELECTRICAL AND
ELECTRONICS SCIENCE**

Time : 3 hours

Maximum Marks : 70

***Note :** Answer any **five** questions. Use of scientific calculator is allowed. Assume any data, if missing.*

1. (a) A coil is wound uniformly with 300 turns over a steel ring of relative permeability 900 having a mean diameter of 20 cm. The steel ring is made of a bar having circular cross-section of diameter 2 cm. If the coil has a resistance of 50 ohm and is connected to a 250 V d.c. supply, calculate the
- (i) m.m.f. of the coil,
 - (ii) field intensity in the ring,
 - (iii) reluctance of the magnetic path, and
 - (iv) total flux.

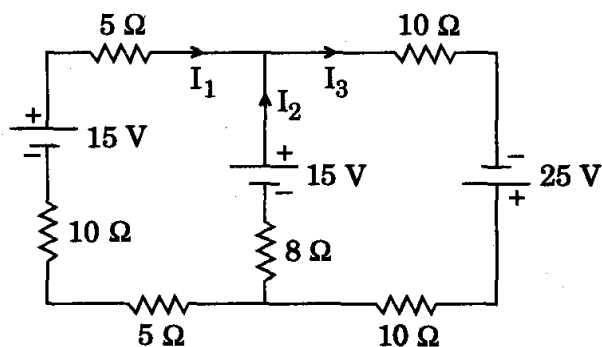
6

(b) Distinguish between conductors, semiconductors and insulators. 6

(c) Two coils with negligible resistance and of self-inductance of 0.2 H and 0.1 H respectively are connected in series. If their mutual inductance is 0.1 H , calculate the effective inductance of the combination. 2

2. (a) State and explain KVL and KCL laws. 6

(b) Find the currents I_1 , I_2 and I_3 by using superposition theorem in the following network : 6



(c) State the maximum power transfer theorem. 2

3. (a) Three capacitors, each of $150\ \mu\text{F}$, are connected in delta to a 400 V, 3-phase, 50 Hz supply. Calculate the line current. What will be the capacitance of each of the three capacitors such that when connected in star across the same supply, the line current remains same ? 6
- (b) Derive the e.m.f. equation of a single-phase transformer. 6
- (c) Why is cooling of a transformer essential ? 2
4. (a) Why is a starter necessary for starting of a large 3-phase induction motor ? Describe star-delta starter with a neat sketch. 6
- (b) The series resonant circuit is often called as acceptor circuit and parallel circuit as the rejector circuit. Explain. 6
- (c) A 3-phase induction motor having 8 poles runs on a 50 Hz supply. If it operates at full load at 720 r.p.m., calculate the slip. 2
5. (a) What is a Zener diode ? Draw and explain its characteristics. 6
- (b) Describe briefly how a p-n junction is formed with p-type and n-type semiconductors. How is a depletion layer formed ? 6
- (c) What are the characteristics of an ideal operational amplifier ? 2

6. (a) Draw the architecture of 8085 MPU and briefly explain the various sub-units. 6
- (b) What is Transistor biasing ? Explain any one method of biasing. 6
- (c) Give the symbol and truth table of NAND logic gate. 2
7. (a) Show how the amplifier is used as
- (i) an inverting amplifier, and
 - (ii) a non-inverting amplifier.
- Also give the gain equations. $3+3=6$
- (b) Explain the De Morgan's theorem. Also calculate $(AB + C)(AB + D)$. $3+3=6$
- (c) What are semi-conductor memories ? 2
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