Reg. No. ☐☐☐☐☐☐☐☐☐☐

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)
MAKE UP EXAMINATIONS, DEC 2015 / JAN 2016

SUBJECT: POWER QUALITY ISSUES [ELE 445]
REVISED CREDIT SYSTEM

Time: 3 Hours　　　　　　　9 January 2016　　　　　　　MAX. MARKS: 50

1A.	How power quality issues are classified. Explain any TWO issues in detail with its cause and Consequences.	**06**
1B.	What is System Average Interruption Duration Index (SAIDI). Explain it with an example	**04**
2A.	Determine the current rating factor for a 300-kcmil copper conductor required to carry a nonlinear load with the following harmonic frequency content:	

Fundamental = 250 A, 3rd harmonic = 25 A, 5th harmonic = 60 A, 7th harmonic = 45 A, 11th harmonic = 20 A, The DC resistance of 300-kcmil cable = 0.17 Ω per mile.

X	K	X	K	X	K
0	1	1.4	1.01969	2.7	1.22753
0.1	1	1.5	1.02558	2.8	1.2662
0.2	1	1.6	1.03323	2.9	1.28644
0.3	1.00004	1.7	1.04205	3.0	1.31809
0.5	1.00032	1.8	1.0524	3.1	1.35102
0.6	1.00067	1.9	1.0644	3.1	1.38504
0.7	1.00124	2.0	1.07816	3.3	1.41999
0.8	1.00212	2.1	1.09375	3.4	1.4577
0.9	1.0034	2.1	1.11126	3.5	1.49202
1.0	1.00519	2.3	1.13069	3.6	1.52879
1.1	1.00758	2.4	1.15207	3.7	1.56587
1.2	1.01071	2.5	1.17538	3.8	1.60312
1.3	1.0147	2.6	1.20056	3.9	1.64051

05

2B.	Discuss Impacts of poor power quality on power transformers & induction motor	**05**

3A. A three phase fully controlled bridge converter feeds power to a load having a resistance of R =10 ohms and very large inductance to result in continous current with an input from a three phase supply, 415 V, 50 Hz. Feeder conductors have the resistance of order 0.1 ohms each. Fpr the firing angles of 60°, calculate

   a) Ac source RMS current

   b) Losses in the distribution system

   c) If an ideal shunt compensator is used to compensate power factor to unity then, calculate AC source RMS current & losses in the distribution system

   d) Ratio of losses in distribution system without and with compensation **06**

3B. What is the significance of earth resistance test? How this test is carried out for residential and small commercial buildings electrical system **04**

4A. A single-phase diode bridge rectifier is supplied from 230 V, 50 Hz ac mains as shown in Fig. 1. The dc load resistance is R = 100 Ohms and load inductance is L = 50 mH. (a) Design a DC side LC (Inductive- Capacitive) filter so that the ripple factor of the output voltage is less than 5%
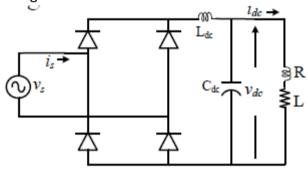

Figure 1 **06**

4B. Explain the Design procedure involved in the design of harmonic filter(passive shunt filter) **04**

5A. Using PQ theory explain the basic principle & control of shunt current compensation **05**

5B. With necessary block diagrams explain the design & working shunt active filter with constant active power compensation **05**

6. With the help of detailed block diagram explain the integration of the series and shunt active filter controllers of unified power quality conditioner(UPQC) **10**