

End Semester Examination, December 2017

Program: B. Tech- FSE

Semester – V

Subject (Course): Fire Engineering-II ( IT IS SAFETY IN ELECTRICAL DESIGN)

Max. Marks : 100

Course Code : FSEG 323

Duration : 3 Hrs

No. of page/s: 2

**Section-A: Answer the following:**

**20\* 1 = 20 marks**

1. **Define the following:**

[8]

- a. Balanced Fault
  - b. Hazardous Area
  - c. 'RAB'
  - d. MIE
2. Draw the OLD of laptop powered by 230V, 50Hz supply from a 5A electrical outlet via charger of 100W, 10VDC. [4]
3. Give reactance diagram of two T/Fs -11KV/415V supplied from 2no's of 110KVA & 250KVA, 11 KV Diesel Generators [4]
4. Give the area hazardous classification as per NFPA. [4]

**Section-B: Answer the following:**

**5 \* 8 =40 Marks**

1. An electrical equipment has the following things on its name plate: "Ex i<sub>b</sub> IIC T1 Z-0".



Name and brief the details of terms mentioned above.

[4+4]

2. High voltage equipment poses high risk to employees. An EHV equipment is labeled as: Explain specifications listed in the label shown above.
3. Calculate the 3 Phase fault level for the following case. [8]  
**A generator connected to a transformer, which is connected to transmission line serving an induction motor. Fault occurred at input terminals of motor. Consider generator values as reference.**

The positive sequence reactance's are as given below.

**Generator:** 0.1 p.u , EMF- 1.0 P.U on 11KV, 1 MVA base

**Transformer:** 0.09 p.u on 11KV/415V, 2 MVA

**Tr. Line:** 20ohms, 415V

**Induction Motor** 415V, 5 HP, Reactance- 0.4 P.U

4. Postulate steps in arc flash hazard analysis, also give categories of PPEs to be used around an equipment. [4+4]
5. Discuss the construction and function of “Buchholz’s relay”. [8]

**Section-C: Answer any two of the following:**

**2 \*20 = 40 Marks**

1. Discuss the specifications of the following equipment:
  - a. Ex ‘d’- protection
  - b. Ex ‘e’- protection
  - c. Ex ‘o’- protection
  - d. Ex ‘m’- protection
2. Detail the safe design requirements of power transformers and electromagnetic relays.
3. Explain the procedure of arc flash calculations as per NFPA & IEEE-1584. Also, give their comparison.



Roll No: -----

**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**

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**No. of page/s: 2**

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**Max. Marks : 100**  
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**Section-A: Answer the following:**

**20\* 1 = 20 marks**

1. **Define the following:** [8]
  - a. Electrical Fault
  - b. Non-Hazardous Area
  - c. 'PAB'
  - d. MIC
2. Draw the OLD of tablet powered by 230V, 50Hz supply from a 5A electrical outlet via charger of 100W, 10VDC. [4]
3. Give reactance diagram of two T/Fs -11KV/415V supplied from 2no's of 110KVA & 250KVA, 11 KV Diesel Generators [4]
4. Give the area hazardous classification as per NFPA. [4]

**Section-B: Answer the following:**

**5 \* 8 =40 Marks**

1. An electrical equipment has the following things on its name plate: "Ex Ib IIC T1 Z-0". Name and brief the details of terms mentioned above. [4+4]
2. Discuss specifications listed in below label:

 <b>WARNING</b>	
<b>Arc Flash and Shock Hazard</b> <b>Appropriate PPE Required</b>	
1 3' - 8" 2 6.5 3 #2	Arc Flash Protection Boundary Caloric Flash Hazard at 18" Working Distance PPE Level Arc Rated Long Sleeve Shirt, Arc Rated Pants, Arc Rated Face Shield
4 0.48 5 3' - 6" 6 1' - 0" 7 0' - 1"	Shock Hazard voltage in kV when cover is removed Limited Approach Boundary Restricted Approach Boundary - Class 00 Voltage Rated Gloves Prohibited Approach Boundary - Class 00 Voltage Rated Gloves
8 08-02-09    9 Panel PP-1 (Fed From MDP)    10 www.brainfiller.com	

- a. 3. Calculate the 3 Phase fault level for the following case. [8]  
 A generator connected to a transformer, which is connected to transmission line serving a synchronous motor. Fault occurred at input terminals of synchronous motor. Consider generator values as reference.

1. The positive sequence reactance's are as given below.
2. **Generator:** 0.1 p.u , EMF- 1.0 P.U on 11KV, 1 MVA base
3. **Transformer:** 0.09 p.u on 11KV/415V, 2 MVA
4. **Tr. Line:** 20ohms, 415V
5. **Motor 415V, 5 HP,** Reactance- 0.4 P.U @ 0.9 lagging p.f

4. Explain arc flash hazard analysis procedure as per NFPA & IEEE.
5. Discuss the construction and function of “Buchholz’s relay”.

[4+4]  
[8]

**Section-C: Answer any two of the following:**

**2 \*20 = 40 Marks**

1. Discuss the specifications of the following equipment:
  - a. Ex ‘d’ - protection
  - b. Ex ‘i’ - protection
  - c. Ex ‘p’ - protection
  - d. Ex ‘m’ - protection
2. Detail the safe design requirements of power transformers and electromagnetic relays.
3. Explain the procedure of arc flash calculations as per IEEE-1584. Also, give its comparison with NFPA.

