

**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**

End Semester Examination, May 2018

<b>Program:</b> B. Tech-FSE	<b>Semester –</b> <b>IV</b>
<b>Subject (Course):</b> Electrical Technology and Safety in Electrical Systems	<b>Max. Marks : 100</b>
<b>Course Code : FSEG 212</b>	<b>Duration : 3 Hrs</b>
<b>No. of page/s: 2</b>	

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**I. Answer the following: [20 Marks]**

1. Expand and define the following: [10]
  - a. PAB
  - b. CPR
  - c. GFCI
  - d. OCPD
  - e. LOTO
2. Incident Energy is \_\_\_\_\_(definition) [1]
3. Liquid splashes create static accumulation. {T/F} [1]
4. The minimum current that can cause tripping of ELCB/GFCI is \_\_\_\_\_ [1]
5. Low voltage equipment means \_\_\_\_\_ as per IER, 1956. [1]
6. Bonding is \_\_\_\_\_ and earthing is \_\_\_\_\_ [definition] [2]
7. State whether ‘Earthing’ (definitely) prevents electric shock or not. Justify your answer. [2]
8. State various effects caused by “electricity”. [2]

**II. Answer the following: [40 Marks]**

9. Define “Electric Shock”. Enlist and brief various factors that govern the intensity of shock [1+2+5]
10. Mr. Ram, a 16 year old teenager, working in a café cum bakery on daily wage basis. One day when he finished his evening work shift and was about to move out, he noticed that the microwave oven was still “ON”. He went upon to check whether the power switch has been put off or not and came to know that it has been powered off, but something’s wrong with wiring. Due to his previous experience in electrical repairs, he went on to check the supply by using a tester. Unfortunately, when he put tester in neutral, he got heavy shock and immediately was escorted to a hospital nearby. In this case incident:
  - a. What was wrong with supply? [2]
  - b. What kind of protection equipment/installation could have prevented this situation? [2]
  - c. Brief the construction and working of such equipment. [4]
11. **It is necessary to maintain safe distance from an energized equipment, else may cause severe arc flashes.** Discuss about the linear distances to be maintained around an electrically

live equipment to avoid arc flashes, with necessary sketches and quote the code of reference. [6+2]

12. Brief the general procedural steps involved in “Repairing of Coffee Maker”- in Nescafe, UPES in safe manner. [8]

[Or]

13. Explain how the electric shocks can be prevented and/or mitigated. [8]

**III. Answer any two of the following:**

**[40 Marks]**

14. *A process operator was tasked with manually tipping approximately 18 kg (40 lbs) of powder from a plastic drum, constructed from polyethylene, into a metal process vessel. The plastic drum contained a combustible powder that had a minimum ignition energy of 12 milli-joules. A metal chime was positioned around the circumference of the top of the plastic drum to provide it with impact protection from daily usage in the plant. The operator tipped the powder into the process vessel, resting the drum on the edge of the vessel. As he removed the drum from the vessel when the powder was fully deposited there was an ignition of the dust cloud that had formed at the top of the vessel.*

a. Explain the cause of incident stating the reasons of accumulation and ignition. [10]

b. Postulate the measures by which the incident could have avoided or impact could have been reduced? [10]

15. Enlist & discuss various protection schemes to be employed for electrical equipment in hazardous areas. Give their applicable areas of usage. [3+12+5]

16. Give all the safety provisions to be applied for distribution transformer and discuss the construction and working of Buchholz’s relay. [5+15]

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<b>Name of the College</b> (Please tick, symbol is given)	:	SOE	✓	SOB		SOL	
<b>Program</b>	:	B. Tech/FSE					
<b>Semester</b>	:	IV					
<b>Name of the Subject (Course)</b>	:	Electrical Technology and Safety In Electrical Systems					
<b>Course Code</b>	:	FSEG 212					
<b>Name of Question Paper Setter</b>	:	V Venkata Krishnakanth					
<b>Employee Code</b>	:	40001121					
<b>Mobile &amp; Extension</b>	:	9536168558					
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**Note: - Pl. start your question paper from next page**

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**I. Answer the following: [20 Marks]**

1. Expand and define the following: [10]
  - a. RAB
  - b. MIE
  - c. RCD
  - d. MCB
  - e. HRG
2. Burns due to exposure of skin to electricity are \_\_\_\_\_ [1]
3. Sub-surface filling minimizes the chances of static accumulation. {T/F} [1]
4. The minimum current that can cause tripping of ELCB/GFCI is \_\_\_\_\_ [1]
5. Medium voltage equipment means \_\_\_\_\_ as per IER, 1956. [1]
6. Grounding is \_\_\_\_\_ and earthing is \_\_\_\_\_ [definition] [2]
7. State whether 'Earthing' may prevent electric shock or not. Justify your answer. [2]
8. State various hazards caused by "electricity". [2]

**II. Answer the following: [40 Marks]**

9. Define "Electric Arc Flash". Discuss in short about the causes and hazards, prevention and protection methods, for the same. [1+2+2+3]
10. Mr. Ram, a 16 year old teenager, working in a café cum bakery on daily wage basis. One day when he finished his evening work shift and was about to move out, he noticed that the microwave oven was still "ON". He went upon to check whether the power switch has been put off or not and came to know that it has been powered off, but something's wrong with wiring. Due to his previous experience in electrical repairs, he went on to check the supply by using a tester. Unfortunately, when he put tester in neutral, he got heavy shock and immediately was escorted to a hospital nearby. In this case incident:
  - a. What was wrong with supply? [2]
  - b. What kind of protection equipment/installation could have prevented this situation? [2]
  - c. Brief the construction and working of such equipment. [4]
11. **It is necessary to maintain safe distance from an energized equipment, else may cause severe arc flashes.** Discuss about the linear distances to be maintained around an electrically

live equipment to avoid arc flashes, with necessary sketches and quote the code of reference. [6+2]

12. Brief the general procedural steps involved in “Repairing of 1-hp motor used along with pump”- in a household, UPES in safe manner. [8]

[Or]

13. Explain the hazardous area classification as per NFPA and IEC/IS standards. [8]

**III. Answer any two of the following:**

**[40 Marks]**

14. A chemical factory. has erected three MS cylindrical storage vessels with a capacity of 24 KI. - 2 nos. and 30 KI. - 1 no. At the time of incident, a tanker lorry with 24 KI. Petroleum product was brought to the premises *for* unloading into the installed storage tanks. The workers tried to unload the petroleum product into the left extreme vessel of the 3 vessels (30 KI. capacity) by using the rubber hose, one end of the rubber hose was connected to the out-let valve of the lorry and the other end of the rubber hose was connected to the 30 KI. horizontal tank valve. While transferring the material, there was some leakage at the point of outlet valve connected to the rubber hose. In order to control the leakage, the workers decided to move the lorry to correct position. The driver started the tanker lorry and immediately there was a sudden fire noticed at the out let valve leakage area. The workers tried to put out the fire but they could not do so. Fire spread out to the other area and consequently the storage vessel got suddenly burst out and thrown out from its foundation. Because of this explosion, the petroleum material became a fire ball, causing minor burn injury to about 23 onlookers and nearby factory workers.

a. Point the causes of explosion [5]

b. Give the sequence of events that lead to devastation. [10]

c. How this could've been avoided? [5]

15. Enlist & discuss various protection schemes to be employed for electrical equipment in hazardous areas. Give their applicable areas of usage. [3+12+5]

16. Give all the safety provisions to be applied for distribution transformer and discuss the construction and working of Buchholz's relay. [5+15]