

JK Lakshmipat University Jaipur

Institute of Engineering and Technology

End Term Examination, May, 2019

B. Tech. in EE/CE/ME/CHE, Semester VI / M.Tech. - Sem II

Roll No.....

EE 611/MTHSE222: Electrical Safety

Time: 3 hours

Max. Marks: 60

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q 1	A 30-year-old electrical technician was assisting a company service representative test the voltage-regulating unit on a new rolling mill. While the electrical technician left the area to get the service manual, the service representative opened the panel cover of the voltage regulator's control cabinet to prepare for tracing down the low-voltage wiring in question. The wiring was not color-coded and the service representative was not using personal protective equipment (PPE). The service representative climbed onto a nearby cabinet in order to view the wires. The technician soon returned and began working inside the control cabinet near exposed and energized electrical conductors. The technician began tugging on the low-voltage wires so that the service representative could attempt to identify them from above. The company service representative heard the electrical technician making gurgling sounds. As he looked down to see the victim, he noticed the victim was shaking as though he were being shocked. Cardiopulmonary resuscitation (CPR) was administered to the victim; however, he was pronounced dead almost 2 hours later. It was determined that he had made contact with an energized electrical conductor. Develop a mechanism to avoid such incidents at workplace.	10 Marks
Q 2	In a factory, extraction of oil from rice bran was being carried on using hexane as a solvent. On a day of accident, repair works to the gadder frames of the extractor meant for transferring the rice bran was being carried on. A 40W electrical hand bulb was used for providing lighting. When the worker was holding the electrical hand bulb near the view glass opening, the hand bulb hit against the view glass opening. Spark emanated due to this, ignited the hexane vapour which was present in the extractor, a big fire consequently. Design the suitable protection scheme for avoiding such incidents.	05 Marks
Q 3	Identify the responsibilities of supplier of electricity and user of electricity as per Indian Electricity Act.	05 Marks
Q 4	In a home a person get out the following small appliances, plug them in and turn them on. Mixer (81 Ω) Crockpot (62 Ω) Juicer (43 Ω)	10 Marks

	Blender (21 Ω) Electric Fondue (16 Ω) Wok (12 Ω) Rotisserie (7.5 Ω) Deep-fat fryer (7.0 Ω) The resistance values for each appliance is listed in parenthesis. Each appliance is plugged in to 110-volt receptacles which are wired in parallel on the same circuit. The circuit is protected by a 20-amp circuit breaker. a. Determine the overall current on the circuit with the mixer and crockpot operating. b. Determine the overall current on the circuit with the mixer, crockpot and juicer operating. c. Determine the overall current on the circuit with the mixer, crockpot, juicer and blender operating. d. Determine the overall current on the circuit with the mixer, crockpot, juicer, blender and electric fondue operating. e. Determine the overall current on the circuit with the mixer, crockpot, juicer, blender, electric fondue, and wok operating. f. Determine the overall current on the circuit with the mixer, crockpot, juicer, blender, electric fondue, wok, and rotisserie operating. g. Determine the overall current on the circuit with the mixer, crockpot, juicer, blender, electric fondue, wok, rotisserie, and the deep-fat fryer operating. h. At what point in the progression of turning on appliances will the circuit become overloaded and the circuit breaker interrupt the circuit.	
Q 5	Why Earthing is required? Design the earthing system with protective devices for 33/0.4 kV substation in JKL campus	10 Marks
Q 6	A motor works on 2 min load cycle constituted as follows: 0-15 Sec. load rising from 0 h.p. to 1050 h.p., 15-70 Sec. constant load of 600 h.p., 70 -85 Sec. 800 h.p. 85 -95 sec. 200 h.p. and 95-120 Sec. 200 h.p. to 0 h.p. Determine the continuous rating of the motor that would be suitable for the load cycle. Assume the rating to depend upon the (i) rms value of loading (ii) average value of loading.	10 Marks
Q 7	A 50 H.P. 500 rpm shunt motor is used for shop. The stored energy of the machinery averages 4090/H.P. Assuming the load torque during starting to be equal to the full load torque, and starting current to be twice the full load current, estimate the time taken to start the motor.	10 Marks