

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular), November 2016

B. Tech in Electrical Engineering, Semester VII

Roll No.....

EE721: Power Quality & Utilization of Electric Power

Time: 3 hours

Max. Marks: 100

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.1A Short answer/objective type questions (10 questions @ 1 mark)

10

- i. The power factor at which the direct arc furnace operates is
(a) Low lagging (b) Low leading
(c) Unity (d) High leading
- ii. In induction heating, which of the following is of high value?
(a) Frequency (b) Current
(c) Voltage (d) Power Factor
- iii. The normal voltage used in dielectric heating is
(a) 1.5 kV (b) 15 kV (c) 22 kV (d) 33 kV
- iv. Spot welding
(a) provides mechanical strength
(b) makes the weld air tight
(c) makes the weld water tight
(d) all of the above
- v. The basic electrical requirement in arc welding is that there should be
(a) high open-circuit voltage (b) no arc blow
(c) dc power supply (d) coated electrodes
- vi. welding is used for welding of car body.
(a) Spot (b) Gas
(c) Carbon-arc (d) Atomic hydrogen
- vii. Ammonia is preferred as a refrigerant in large commercial installations because
(a) it has a low working pressure
(b) it is non-tonic
(c) it is relatively cheap
(d) all of the above
- viii. In case steam locomotive an average coal consumption per km of run is
(a) 25-30 kg (b) 35-40 kg (c) 45-50 kg (d) 55-60 kg
- ix. Long distance railways operates on
(a) 25 kV single phase ac (b) 25 kV 3-phase ac
(c) 600 V dc (d) 15 kV 3-phase ac
- x. The maximum speed on which trains run on main line railway service is

(a) 160 kmph

(b) 120 kmph

(c) 100 kmph

(d) 200 kmph

- Q.2 Short answer type questions (4 questions @ 2.5 marks) 10
- What are the fluxes used in arc welding?
 - By making a table list out the efficiency of different type of traction system.
 - What is comfort air-conditioning?
 - Why the magnetic circuit of a traction motor is not made of cast iron?
- Q.3A By making an equivalent circuit and related waveforms, explain capacitor bank switching and its effects. 05
- Q.3B What are active filters? Why these are superior over passive filters? 3+2
- Q.4A Explain the concept of hybrid filter. List the advantages of hybrid filters over other filters. 3+2
- Q.4B Explain the different methods of electric heating and their field of application. 05
- Q.5A Name and describe various types of resistance welding processes. 05
- Q.5B Compare dc and ac welding methods. 05
- Q.6A Draw the electric circuit of a refrigerator and explain its working. How can temperature inside the refrigerator be adjusted? 3+2
- Q.6B Write a short note on water cooler. 05

OR

A drawing office $6\text{m} \times 5\text{m} \times 4\text{m}$ size is to be heated. The temperature of the room is to be kept at 25°C when the outside temperature is 5°C . The air is to be renewed every 15 minutes. Find the necessary rating of electric heater. The heat loss from the walls is $836 \times 10^{-6}\text{J}/^\circ\text{C}/\text{hour}$. Assume heat required to raise temperature of 1 m^3 air is 1220 J. 05

- Q.7A Explain the requirements for ideal traction and show which drive satisfy almost all the requirements. 05
- Q.7B An electric train is to have acceleration and braking retardation of 0.8 km/h/s and 3.2 km/h/s respectively. If the ratio of maximum to average speed is 1.3 and time for stops 26 seconds, find schedule speed for a run of 1.5 km. assume simplified trapezoidal speed-time curve. 05

OR

A suburban electric train has a maximum speed of 70 kmph. The schedule speed including a station stop of 30 seconds is 45 kmph. If the acceleration is 1.5 kmph/s , find the value of retardation when the average distance between stops is 4 km. 05

- Q.8A Briefly discuss the desirable feature (electrical) of traction motors. 5+5
- The characteristics of dc series motor when operating at 600 V and driving 107 cm wheels are as follows:

Current (A)	500	400	300	200
Train Speed (kmph)	35.6	38.5	42.5	50.5
Tractive effort (kg)	2580	1960	1380	725

Two of such motors are mounted on a motor coach. The wheels driven by one motor A are 107 cm in dia and other motor B are 102 in dia. Calculate the power input and tractive efforts of each motor when motors are connected in parallel and train speed is 40 kmph. Assume resistance of each motor as 0.08 ohm.

Q.9A In a 3-phase 440 V, 50 Hz, star-connected 20 kW oven, the temperature of wire is 1200°C and that of charge is 700°C. If radiating efficiency is 0.6 and emissivity is 0.9, design the heating element. A strip of thickness 0.025 mm having resistivity $1.05 \times 10^{-6} \Omega\text{-m}$ is used. 10

Q.9B Write short note on any two the following: 5+5
(a) Traction systems in India
(b) Battery driven vehicles and their applications.
(c) Trolley bus system of traction

OR

Write short note on any two the following: 5+5
(a) Harmonics measurement methods
(b) Voltage interruptions
(c) Power quality standards