

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), Nov.-Dec. 2015

B. Tech. in Electrical Engineering, Semester VII

Roll No.....

EE-721: Power Quality & Utilization of Electrical
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	Objective type multiple choice questions (10 questions @ 1 mark)	10
i.	Interruptions are a complete loss of: (a) current (b) voltage (c) frequency (d) short circuit	
ii.	Harmonic currents are generated at load distortion level by: (a) generation (b) transmission (c) distribution (d) all the above	
iii.	Reactive power compensation improves: (a) power factor (b) reduces losses (c) regulates the voltage (d) all the above	
iv.	In induction heating, the depth up to which current will penetrate is proportional to: (a) Frequency (b) (Frequency) ² (c) 1/√(Frequency) (d) 1/Frequency	
v.	In a refrigeration system, the expansion device is connected between the: (a) Compressor and condenser (b) Condenser and receiver (c) Receiver and evaporator (d) Evaporator and compressor	
vi.	The driving force for refrigeration in vapour absorption refrigeration plants is: (a) Mechanical energy (b) Electrical energy (c) Thermal energy (d) All of the above	
vii.	In TIG (GTAW) Welding we use an INERT gas. Which GAS could this be? (a) Oxygen (b) Air (c) Acetylene (d) Argon	
viii.	The coefficient of adhesion is highest when: (a) the rails are dry (b) the rails are oiled (c) the rails are wet with dew (d) the rails are dusty.	
ix.	When the speed of the train is estimated taking into account the time of stop at a station in addition to the actual running time between stops, is known as: (a) Average speed (b) Schedule speed (c) Notching speed (d) Free running speed.	
x.	The specific energy consumption for suburban services is usually: (a) 18 to 25 watt-hours per tonne km (b) 50 to 75 watt-hours per tonne km (c) 125 to 150 watt-hours per tonne km (d) 155 to 200 watt-hours per tonne km.	
Q.2	Short answer type questions (4 questions @ 2.5 marks)	10
i.	Differentiate between linear loads and non-linear loads.	
ii.	What is expert system? What are the advantages of expert system?	
iii.	Why alternating current is found most suitable for resistance welding?	
iv.	Define 'crest speed' and 'schedule speed' and discuss the factors which affect the schedule speed of train.	
Q.3A	What are the various devices for controlling harmonic distortion? Explain briefly about it.	05
Q.3B	Explain the principle of dielectric heating and derive an expression for the heat produced in a Dielectric heating.	05

Q.4A	Explain briefly about the phenomena of how current distortion affects the voltage distortion under the presence of harmonics.	05
Q.4B	A 30 kW, 3-phase, 400 V resistance oven is to employ nickel-chrome strip 0.025 cm thick for the 3-phase star-connected heating elements. If the wire temperature is to be 1100°C and that of charge is to be 700°C, estimate a suitable width for the strip. Assume radiating efficiency as 0.6 and emissivity as 0.9. the specific resistance of the nichrome-alloy is 1.03×10^{-6} ohm-meter. State any assumption made.	05
Q.5A	Draw electric circuit of a refrigerator and explain its working. How can temperature inside the refrigerator be adjusted?	05
Q.5B	Explain the working of a central air-conditioning system.	05
Q.6A	A slab of insulating material 130 cm ² in area and 1 cm thick is to be heated by dielectric heating. The power required is 380 W at 30 Mhz. material has a relative permittivity of 5 and p.f. of 0.05. absolute permittivity = 8.854×10^{-12} F/m. determine the necessary voltage.	05
Q.6B	Explain the harmonic effects on power system equipments briefly.	05
OR		
Q.6B	Derive the Expression of specific energy output using simplified speed time curve.	05
Q.7A	What is electric traction system? What are the requirements of an ideal traction system?	05
Q.7B	What is the main difference between main line train service and local train service? Why a locomotive is preferred for the main line train service and motor coaches for the suburban train service?	05
OR		
Q.7B	Explain the speed control for dc traction motors using series-parallel method.	05
Q.8	What are the advantages of regenerative braking? Explain how regenerative braking can be obtained in dc locomotives.	10
Q.9A	An electric train has an average speed of 42 kmph on a level track between stops 1400 meter apart. It is accelerated at 1.7 km/h/s and is braked at 3.3 km/h/s. draw the speed time curve for the run.	10
Q.9B	Explain the function of negative booster in an electric tramways.	10
OR		
Q.9B	A 100-tonne electric train has a rotational inertia of 10 percent. This train while running between two stations which are 2.5 km apart has an average speed of 50 km/h. the acceleration and retardation during braking are respectively 1 km/h/s and 2 km/h/s. the percentage gradient between these two stations is 1 percent and the train is to move up the incline. The track resistance is 40 N/t. if the combined efficiency of the electric train is 65 percent, determine: (a) total energy output at the driving axles (b) total energy consumption (c) Specific energy consumption. Assume that journey estimation is being made in simplified trapezoidal speed-time curve.	10