CS/B.TECH(EE) (SUPPLE)/SEM-7/EE-702A/09
UTILIZATION OF ELECTRICAL POWER (SEMESTER - 7)

1. ..... *Signature of Invigilator*

2. ..... *Signature of the Officer-in-Charge*

Reg. No. | | | | | | | | | | | | | | |

Roll No. of the Candidate | | | | | | | | | | | | | | |

CS/B.TECH(EE) (SUPPLE)/SEM-7/EE-702A/09

ENGINEERING & MANAGEMENT EXAMINATIONS, JULY – 2009

UTILIZATION OF ELECTRICAL POWER (SEMESTER - 7)

Time : 3 Hours] [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.
   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

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Marks Obtained

	Group – A										Group – B			Group – C				
Question Number																	***Total Marks***	***Examiner's Signature***
Marks Obtained																		

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Head-Examiner/Co-Ordinator/Scrutineer

S-53023 (28/07)

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GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

i) The electric locomotives run faster at curved routes as compared to steam locomotives as

a) the centre of gravity of electric locomotive is higher than that of steam locomotive

b) the centre of gravity of electric locomotive is lower than that of steam locomotive

c) the speed at curved routes is independent of location of centre of gravity.

ii) In suburban services as compared with urban services

a) the coasting period is longer

b) the coasting period is smaller but free running period is longer

c) the coasting period and free running period are smaller

d) none of these.

iii) For a given run and a given schedule speed

a) the specific energy consumption is lower, the higher the acceleration and retardation.

b) the specific energy consumption is higher, the higher the acceleration and retardation.

c) the specific energy consumption is lower, the lower the acceleration and retardation.

iv) The limit of visible spectrum is roughly between

a) 4000 Å to 7500 Å

b) 100 Å to 4000 Å

c) 1000 Å to 7500 Å

v) An auto-transformer used with sodium vapour lamp should have

a) high step-up ratio b) high leakage resistance

c) high step-down ratio d) high efficiency.

vi) Filament lamp at starting will take current

a) equal to its full running current

b) more than its full running current

c) less than its full running current

d) none of these.

vii) In arc welding, the temperature of the arc is of the order of

a) 500 deg. C b) 1000 deg. C

c) 3500 deg. C d) 10000 deg. C.

viii) Aluminium is difficult to weld because

a) it has an oxide coating b) it conducts away heat very rapidly

c) of (a) and (b) d) of none of these reasons.

ix) In case of seam welding, the flow of current through the electrode should be

a) continuous

b) intermittent

c) can be both

x) Induction heating is used for

a) insulating materials

b) magnetic materials

c) non-magnetic materials (conducting)

d) both magnetic and non-magnetic conducting materials.

xi) The depth of penetration at 1000 Hz for a particular charge is 2 cm. At 250 Hz, the depth will be

a) 0.5 cm b) 1 cm

c) 4 cm d) 8 cm. [ ]

xii) For dielectric heating, the range of frequency normally used is

a) 10 kHz to 1000 kHz

b) 100 kHz to 1 MHz

c) 1 MHz to 10 MHz

d) 10 MHz to 40 MHz

e) none of these. [ ]

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. What are the main characteristics of traction motor to be fulfilled ? What are the different train line services in India ?

3. What is the principle of the electro-deposition ? Explain the factors on which the quality of electro-deposition depends. 2 + 3

4. a) Draw and explain typical speed-time curve for train movement for suburban service and main line service. 3

b) What are the advantages and disadvantages of Electric traction ? 2

5. a) What are the advantages of coated electrodes in welding process ? 2

b) What is meant by negative resistance characteristic of an electric arc ? How is the arc stabilized ? 3

6. a) What are the requirements of a good lighting ? $2\frac{1}{2}$

b) What is glare and how can it be reduced ? $2\frac{1}{2}$

GROUP – C

(Long Answer Type Questions)

Answer any *three* questions. 3 × 15 = 45

7. a) What are the processes and types of electric heating ?

   b) What are the differences between resistance heating and induction heating ?

   c) A 75 kW, 400 V, 3-ph resistance furnace has 3 star connected heating elements of Ni-Cr wire. The wire temperature to be 1000°C and temperature of the charge 600°C. Estimate

      i) the diameter of the wire.

      ii) the length of the heating element wire.

   Take the emissivity 0.9 and radiation efficiency as 0.6 and resistivity of the wire 1.016×10^{-6} ohm-m. 3 + 3 + 9

8. a) What is specific energy consumption ?

   b) Estimate the factors which affect the specific energy consumption of trains operating at a given schedule speed.

   c) A 400 tonnes train starts up a gradient in 75 at the rate of 1.6 kmphps. The tractive resistance is 66.75 NW per tonne and the allowance for rotational inertia has to be made at the value of 10 per cent.

   Calculate (i) the energy in kwh usefully employed in attaining a speed of 48 kmph from rest, (ii) the specific energy consumption in Wh per tonne-km when running at a steady speed of 56 km up to this gradient if overall efficiency of equipment is 70 per cent. 3 + 6 + 6

9. a) What do you understand by 'Regenerative Braking' ?

   Regenerative Braking is not applicable for *d.c.* series motor. How is the same applied in traction service ?

   b) A train weighing 200 tonnes uses regenerative braking on a down gradient of 2 per cent when the speed is changed from 60 kmph to 20 kmph over a distance up 4 kms. Determine the electrical energy and average power returned to the supply system. Assume tractive resistance of 40 N/tonne, rotational inertia of 10 per cent, and efficiency of conversion of 75 per cent. If regenerative braking does not change the speed down the gradient, determine the power fed into the supply system. 7 + 8

10. a) Define the term "coefficient of adhesion" and explain the factors on which it depends. How does the value of coefficient of adhesion affect the slipping and skidding of driving wheels of traction units ?

b) Why is the coefficient of adhesion in electric traction grater than that in steam locomotive ?

c) A train weighing 200 tonnes is accelerated up a one per cent gradient with an acceleration of 1 kmphps. Determine the minimum adhesive weight of a locomotive for this purpose if the coefficient of adhesion is 0·2. Assume train resistance as 50 newtons per tonne and allowance for rotational inertia 10 per cent. 15

11. a) Explain the function of choke and starter of fluorescent lamps. How many types of starters are used ?

b) Why is coiled-coil filament of tungsten used in incandescent lamps ? What is the size of tungsten wire used ?

c) A 110 V lamp develops 16 CP, and a lamp of the same material working at the same efficiency develops 25 CP on 220V. Compare the diameters and lengths of the filaments. 5 + 4 + 6

12. Write short notes on *any three* of the following : 3 × 5

a) Third Rail System

b) Principle of streetlighting

c) Spot-welding

d) High-frequency heating

e) Electroplating.

END