

**Diploma in Civil Engineering / Diploma  
in Electrical & Mechanical Engineering**

**Term-End Examination**

**June, 2008**

**BET-024 : E/M ENGINEERING**

*Time : 2 hours*

*Maximum Marks : 70*

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**Note :** *All questions are compulsory. Use of calculator  
is permitted.*

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- 1.** Select the correct answer from the given four alternatives  
for the following multiple choice objective type questions.

**14×1=14**

- (i) The opposition to current flow that exists in every  
material is called
- (a) Resistance
  - (b) Conductance
  - (c) Inductance
  - (d) Capacitance

- (ii) Unit of flux density is
- (a) Coulomb/m<sup>2</sup>
  - (b) Coulomb/m<sup>3</sup>
  - (c) Coulomb
  - (d) Coulomb/m
- (iii) Shunt resistance is used to protect the galvanometer from
- (a) strong voltage
  - (b) strong current
  - (c) strong resistance
  - (d) strong capacitance
- (iv) A sinusoidal function of time is characterised by
- (a) amplitude and angular frequency
  - (b) amplitude and phase angle
  - (c) angular frequency and phase angle
  - (d) amplitude, angular frequency and phase angle
- (v) The DC generator works on the principle laid down by
- (a) Faraday's law
  - (b) Lenz's law
  - (c) Biot-Savart's law
  - (d) Kirchoff's law

(vi) Phase voltage is equal to

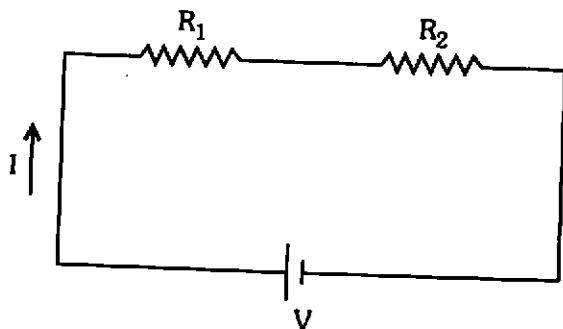
(a) line voltage  $\times \frac{1}{\sqrt{3}}$

(b) line voltage  $\times \sqrt{3}$

(c) line voltage  $\times \frac{1}{\sqrt{2}}$

(d) line voltage  $\times \sqrt{2}$

(vii)



Voltage drop across  $R_2$  is

(a)  $V \cdot \frac{R_1}{(R_1 + R_2)}$

(b)  $V \cdot \frac{R_2}{(R_1 + R_2)}$

(c)  $V \cdot \frac{(R_1 + R_2)}{R_1}$

(d)  $V \cdot \frac{(R_1 + R_2)}{R_2}$

(viii) Which one is correct ?

- (a) Overhead system is safer than underground system
- (b) Initial cost is less for overhead system than underground system
- (c) Frequency of faults is higher in underground cable compared to overhead cable
- (d) Maintenance cost is less for overhead system compared to underground system

(ix) Henry is unit of

- (a) Inductance
- (b) Capacitance
- (c) Capacitor
- (d) Permittivity

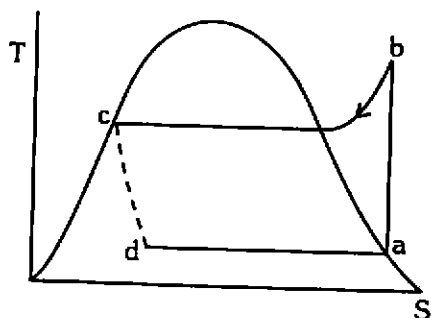
(x) Lift speed of low rise building is

- (a) 1 meter/sec
- (b) 2 meter/sec
- (c) 3 meter/sec
- (d) 4 meter/sec

(xi) In isolated system

- (a) only mass transfer takes place
- (b) only energy transfer takes place
- (c) neither mass nor energy transfer takes place
- (d) both mass and energy transfer take place

(xii)



In the  $T - S$  diagram of a vapour compression cycle, refrigeration effect is

- (a)  $h_b - h_a$
  - (b)  $h_b - h_c$
  - (c)  $h_d - h_a$
  - (d)  $h_c - h_d$
- (xiii)  $PV^n = \text{constant}$ . Which of the following is correct for the equation ?
- (a)  $n = 0$  if it is isothermal process
  - (b)  $n = 1$  if it is constant pressure process
  - (c)  $n = \gamma$  if it is adiabatic process
  - (d)  $n = 1.5$  if it is constant volume process
- (xiv) Which of the following is **not** a part of Refrigeration cycle ?
- (a) Compressor
  - (b) Boiler
  - (c) Condenser
  - (d) Evaporator

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

2x7=14

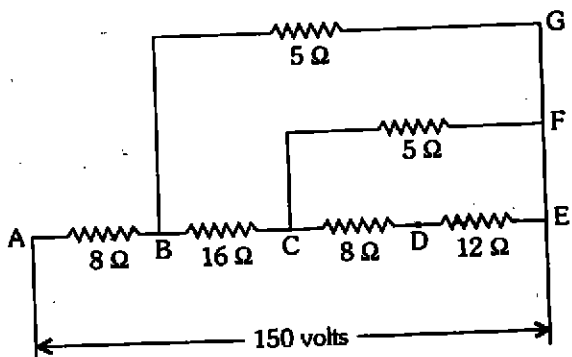
(a) (i) State Ohm's law. Define Specific Resistance and Conductance.

2+2

(ii) With the help of a circuit, explain series and parallel combination of resistors. Deduce an equation for a single equivalent resistance across voltage source for the circuit.

3

(b)



Determine the current flowing through the 12 Ω resistance.

7

(c) The resistance of two conductors is 25 ohms when connected in series and 6 ohms when joined in parallel.

4+3

(i) Calculate the resistance of each wire.

(ii) What ratio of current will be shared when in parallel ?

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

2×7=14

- (a) (i) How is Lead Acid Battery tested ?  
(ii) Write three advantages of Storage Battery.  
(iii) Write at least four applications of Lead Acid Battery. 2+3+2
- (b) (i) Write Faraday's laws.  
(ii) What is Lenz's rule ? What are eddy currents ?  
(iii) Write a short note on solenoid. 2+3+2
- (c) A 50  $\mu\text{F}$  capacitor is charged from 200 V supply. After being disconnected it is immediately connected in parallel with a 30  $\mu\text{F}$  capacitor. Find  
(i) PD across the combination  
(ii) Energy stored before connection, and  
(iii) Energy stored after connection. 7

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

2×7=14

- (a) An electrically driven pump lifts 15 tonnes of water in a minute to a height of 10 meters. Assuming an efficiency of 70% for the pump and 90% for the motor, calculate :
- (i) motor output in kW  
(ii) input current to the motor if the supply voltage is 500 volts  
(iii) cost of running the pump for 3 hours per day for 30 days if the rate of electrical energy is Rs. 3 per unit. 7

- (b) (i) Define Transformer. Write working principle of transformer.
- (ii) What is Voltage Transformation ratio and Current ratio in respect to a transformer?  $2+3+2$
- (c) 2 kg of air at pressure of 7 bar occupies a volume of  $0.28 \text{ m}^3$ . This air is expanded to a volume of  $1.4 \text{ m}^3$  following a law  $PV^{1.2} = \text{constant}$ . Find
- (i) Final temperature
- (ii) Work done, and
- (iii) Heat absorbed or rejected
- Take  $R = 287 \text{ J/kg.K}$  and  $C_p = 1000 \text{ J/kg.K}$  7

5. Answer any **two** of the following :  $2 \times 7 = 14$

- (a) (i) Draw a P - V diagram for Carnot cycle.
- (ii) What are the processes the cycle consists of? Describe.
- (iii) Prove  $\eta = \frac{T_1 - T_3}{T_1}$

where  $\eta$  = Cycle efficiency

$T_1$  = Temperature of hot reservoir

$T_3$  = Temperature of cold reservoir  $1+1+5$

- (b) An IC engine rotates at 2400 rpm. The 4-stroke engine has a cylinder bore diameter of 100 mm and crank radius of 100 mm. From indicator diagram m.e.p. is found as 100 kPa. If mechanical efficiency is 80%, find BP. 7



(c) Write notes on any **two** :

$2 \times 3 \frac{1}{2}$

- (i) Heating and Humidification
- (ii) Summer Air-conditioning
- (iii) Lift (Elevators)
- (iv) Gantry Cranes

