Diploma in Civil Engineering / Diploma in Electrical and Mechanical Engineering

Term-End Examination

December, 2010

BET- 024 : E/M ENGINEERING

Time : 2 hours *Maximum Marks : 70*

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

1. Select the correct answer from the given four alternatives for the following multiple choice objective type questions. **14x1=14**

(a) Which one of the following processes, Will the internal energy of a system remain constant ?

(i) Isothermal (ii) Adiabatic

(iii) Isoboric (iv) Isochoric

(b) An adiabatic process occurs at constant

(i) Temperature.

(ii) Pressure.

(iii) Heat.

(iv) None of the above.

(c) The gas law $\left(\frac{PV}{T} = \text{Constant}\right)$ is true for,

(i) Isothermal process.

(ii) Adiabatic process.

(iii) Both Isothermal & Adiabatic process.

(iv) Neither Isothermal nor Adiabatic process.

(d) The difference between C_p and C_v

(i) Is equal to R.

(ii) Is equal to 2R.

(iii) Is qual to R/2.

(iv) Depends upon the atomicity of gas molecules.

(e) $W = P_1 V_1 \log_e \left(\frac{V_2}{V_1}\right)$ when P_1, V_1 and P_2, V_2 are the initial and final pressures and volume respectively. W is work done.

The above equation is true for :

(i) Isothermal process.

(ii) Adiabatic process.

(iii) Polytropic process.

(iv) Constant pressure process.

(f) In a four stroke cycle engine, all the four operations are completed in _____ revolutions of crank shaft.

(g) Air-conditioning falls in two categories. They are comfort air conditioning and _____ .

(h) If the diameter of a conductor is decreased to half, keeping the length constant, the change in resistance is :

(i) One Forth (ii) Four Times

(iii) Double (iv) Half

(i) A wire of resistance R is cut into four equal parts. These parts are then connected in parallel. The equivalent resistance of the combination will be

(i) 4R (ii) $\frac{R}{4}$

(iii) $\frac{4}{R}$ (iv) $\frac{R}{16}$

(j) For high frequency, an inductor offers

(i) More Inductive reactance.

(ii) Less inductive reactance.

(iii) Zero reactance.

(iv) None of these.

(k) The unit of self inductance of a coil is

(i) Volt s^{-1} A^{-1} (ii) Volt sA

(iii) Volt sA^{-1} (iv) Volt $s^{-1}A$

(l) The SI unit of energy measured by energy meter is

(i) Joules (ii) Watts

(iii) kW (iv) kWH

(m) Energy stored in an inductor is

(i) $\frac{1}{2} L^2 I$ (ii) $\frac{1}{2} CV^2$

(iii) $\frac{1}{2} LI^2$ (iv) $\frac{1}{2} VI^2$

(n) An ammeter is essentially a galvanometer having a

(i) High resistance in series.

(ii) High resistance in parallel.

(iii) Low resistance in series.

(iv) Low resistance in parallel.

2. Answer **any two** of the following : **2x7=14**

(a) A resistance of A = 3 ohms in parallel with B produces a current of 3 amperes when connected across a 6 volt battery. Find :

(i) Current in A and B.

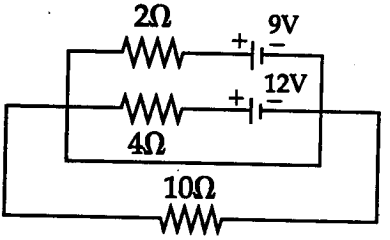
(ii) The resistance of B.

(iii) What resistance X must be put in series with AB combination to reduce the current to 2 amperes ?

(b) In the circuit shown in figure find,

(i) The value and direction of current in $10\,\Omega$ resistance.

(ii) The current supplied by each battery.



(c) Calculate the magnitude of the magnetic field at a point 20 cm away from the straight wire which carries a current of 10 Amperes in it.

3. Answer **any two** of the following : **2x7=14**

(a) What is capacitor? Three capacitors of capacity $10\mu F$, $20\mu F$ and $30\mu F$ are placed in series across a 350 volt source. Determine.

(i) Equivalent capacitance of the combination.

(ii) Charge on each capacitor.

(iii) Voltage drop across each capacitor.

(b) A 250 volt D.C. shunt motor has an armature resistance of 0.10 ohms and field resistance of 500 ohms. The normal speed is 1000 r.p.m. and the armature current is 50 amperes. What additional resistance should be added in the field to increase the speed to 1500 r.p.m. Assume that the armature current remaining the same and magnetising curve is a straight line.

(c) Write EMF equation of the transformer. A 20 kVA transformer has 500 turns on the primary and 100 turns on the secondary winding. The primary is connected to 6600 V 50 Hz supply. Find the full load primary and secondary currents, the secondary e.m.f. and the maximum flux in the core. Neglect leakage and no load primary current.

4. Answer *any two* of the following : **2x7=14**

Explain with suitable sketches, the :

(a) Working of a four-stroke otto cycle engine.

(b) Discuss briefly the comparision between four stroke and two stroke cycle engine.

(c) Explain briefly the simple vapour compression refrigeration system with the help of a neat diagram.

5. Answer **any two** of the following : **2x7=14**

(a) Explain with neat diagram. The working of summer air conditioning system.

(b) 0.1 m^3 of air at a pressure of 1.5 kgF/cm^2 is expanded isothermally to 0.5 m^3. Calculate the final pressure of the gas and heat supplied during the process. Also calculate the work done during expansion of gas.

(c) A certain gas occupies a space of 0.3 m^3 at a pressure of 2 kgF/cm^2 and a temperature of 77° C. It is heated at a constant volume, until the pressure is 7 kgF/cm^2.

Determine :

(i) Temperature at the end of the process.

(ii) mass of the gas.

(iii) change in internal energy.

(iv) change in enthalpy.

Assume $c_p = 1.005$ kJ/kg K,

$c_v = 0.712$ kJ/kg K,

and $R = 287$ J/kg K.