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**BET-024**

# DIPLOMA IN CIVIL ENGINEERING (DCLE(G)) / DIPLOMA IN ELECTRICAL AND MECHANICAL ENGINEERING (DEME) / DCLEVI / DMEVI / DELVI / DECVI / DCSVI

## Term-End Examination

## December, 2015

00631

## BET-024 : E/M ENGINEERING

*Time : 2 hours* *Maximum Marks : 70*

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

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

   (a) If the temprature remains constant, the volume of the given mass of a gas is inversely proportional to the pressure. This is known as

   (i) Charles' Law

   (ii) Boyle's Law

   (iii) Joule's Law

   (iv) Gay-Lussac's Law

(b) In which of the following processes, will the internal energy of a system remain constant ?

(i) Isothermal

(ii) Adiabatic

(iii) Isobaric

(iv) Isochoric

(c) A process in which the gas is heated or expanded in such a way that the product of its pressure and volume remains constant is called

(i) Isothermal process

(ii) Isobaric process

(iii) Adiabatic process

(iv) Polytropic process

(d) An adiabatic process occurs at constant

(i) temperature

(ii) pressure

(iii) heat

(iv) None of the above

(e) The air standard efficiency of an Otto cycle is given by

(i) $1 - \frac{1}{r^{(\gamma-1)}}$

(ii) $1 + \frac{1}{r^{(\gamma+1)}}$

(iii) $1 - r^{(\gamma-1)}$

(iv) $1 + r^{(\gamma-1)}$

where r = compression ratio, $\gamma = C_p/C_v$.

(f) The gas law ($\frac{PV}{T}$ = constant) is true for

(i) Isothermal process

(ii) Adiabatic process

(iii) Both isothermal and adiabatic processes

(iv) Neither isothermal nor adiabatic process

(g) The actual power supplied by engine crank shaft is called

(i) Indicated power

(ii) Brake power

(iii) Frictional power

(iv) None of the above

(h) An electric kettle rated at 220 V, 2·2 kW, works for 3 hours. The current drawn will be

(i) 2 amp

(ii) 10 amp

(iii) 25 amp

(iv) 30 amp

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

(i) nR

(ii) R/n

(iii) n/R

(iv) $R/n^2$

(j) The resistance of an ideal voltmeter is

(i) Zero

(ii) Infinity

(iii) 100 Ω

(iv) 500 Ω

(k) One ton of refrigeration is equal to

(i) 1000 kJ

(ii) 3·5 kW

(iii) 1 kW

(iv) 1000 kW

(l) The appropriate material to be used in the construction of resistance boxes, out of the following, is

(i) Copper

(ii) Iron

(iii) Manganin

(iv) Aluminium

(m) Three resistances each of 4 Ω are connected to form a triangle. The resistance between any two terminals is

(i) 12 Ω

(ii) 6 Ω

(iii) $\frac{8}{3}\Omega$

(iv) 2 Ω

(n) In a pure inductive circuit with a.c. source, the current lags behind the emf by

(i) $\pi$

(ii) $2\pi$

(iii) $\pi/2$

(iv) $\pi/4$

**2.** Attempt any ***two*** of the following : *2×7=14*

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

(b) $0{\cdot}1\ m^3$ of air at a pressure of $1{\cdot}5\ kgf/cm^2$ is expanded isothermally to $0{\cdot}5\ m^3$. Calculate the final pressure of the gas and heat supplied during the process. Also calculate the work done during the expansion of gas.

(c) Explain with suitable sketches the working of a four-stroke Otto cycle engine.

**3.** Attempt any ***two*** of the following : *2×7=14*

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

(b) A certain gas occupies a space of $0{\cdot}3\ m^3$ 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 the

(i) temperature at the end of the process,

(ii) mass of the gas,

(iii) change in internal energy, and

(iv) change in enthalpy.

Assume $C_p = 1{\cdot}005\ kJ/kg°K$,

$C_v = 0{\cdot}712\ kJ/kg°K$ and $R = 287\ J/kg°K$

(c) Discuss briefly the comparison between four-stroke and two-stroke engines.

4. Answer any ***two*** of the following : *2×7=14*

(a) A resistance A of 3 ohms in parallel with B, produces a current of 3 Amperes when connected across a 6 V battery. Find

(i) the 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) State Faraday's law of electromagnetic induction.

(c) Three capacitors of capacitance 10, 20 and 40 μF are placed in series across a 350 V source. Determine the

(i) Equivalent capacitance of the combination,

(ii) Charge on each capacitor,

(iii) Voltage drop across each capacitor, and

(iv) Total stored energy.

5. Answer any ***two*** of the following : *2×7=14*

(a) Deduce the expression for the emf induced by the operation of a D.C. generator.

(b) What emf will be generated in an 8-pole wave wound D.C. generator, if it is rotated at 500 RPM ? The flux per pole is 0·05 Weber and the number of armature conductors is 960.

(c) Find the inductance of an inductor which draws a current of 1·1 A when connected to 230 V, 50 Hz voltage. What current will it draw, if the supply voltage is changed to 150 V, 25 Hz ?

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