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BET-024

DIPLOMA IN CIVIL ENGINEERING (DCLE(G)) / DIPLOMA IN MECHANICAL ENGINEERING (DME) / DCLEVI / DMEVI / DELVI / DECVI / DCSVI

00027

Term-End Examination

December, 2017

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*

   (i) The law that governs the force between electric charges is called

   (a) Ampere's Law

   (b) Coulomb's Law

   (c) Faraday's Law

   (d) Ohm's Law

(ii) A current of 2 amps passing through a conductor produces 80 J of heat in 10 seconds. The resistance of the conductor is

(a) 0·5 Ω

(b) 2 Ω

(c) 4 Ω

(d) 20 Ω

(iii) The opposition to current flow that exists in every material is called

(a) Resistance

(b) Conductance

(c) Inductance

(d) Capacitance

(iv) Shunt resistance is used to protect the galvanometer from

(a) Strong voltage

(b) Strong current

(c) Strong resistance

(d) Strong capacitance

(v) The D.C. generator works on the principle laid down by

(a) Faraday's Law

(b) Lenz's Law

(c) Biot-Savart's Law

(d) Kirchhoff's Law

(vi) If the diameter of a conductor is increased to double, keeping the length constant, the change in resistance is

(a) Four times

(b) One-fourth

(c) Double

(d) Half

(vii) Dimensional formula of magnetic flux is

(a) $MLT^{-2}A^{-1}$

(b) $ML^2T^{-2}A^{-1}$

(c) $ML^{-2}T^{-2}A^{-2}$

(d) $ML^2T^2A^{-2}$

(viii) Which of the following is a compression ignition engine ?

(a) Diesel engine

(b) Petrol engine

(c) Gas engine

(d) None of the above

(ix) The expansion ratio (r) is the ratio of

(a) $\frac{v_2}{v_1}$

(b) $\frac{v_1}{v_2}$

(c) $\frac{v_1 + v_2}{v_1}$

(d) $\frac{v_1 + v_2}{v_2}$

where v_1 = volume at the beginning of expansion

v_2 = volume at the end of expansion

(x) The function of a carburettor in a spark ignition engine is to control

(a) Air-fuel ratio

(b) Amount of mixture

(c) Air-fuel ratio and amount of mixture

(d) Compression ratio

(xi) In an isolated system of thermodynamics

(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) A Carnot cycle consists of

(a) Two constant volume and two reversible adiabatic processes

(b) Two isothermal and two reversible adiabatic processes

(c) Two constant pressure and two reversible adiabatic processes

(d) One constant volume, one constant pressure and two reversible adiabatic processes

(xiii) A crane is used for

(a) Boring holes and rocks

(b) Transporting heavy loads

(c) Lifting and placing loads at desired place

(d) Compacting earthfills

(xiv) A two-stroke cycle engine has _____ the number of power stroke as compared to a four-stroke engine at the same speed.

(a) half

(b) same

(c) double

(d) four times

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

(a) Explain Adiabatic Process. Derive an expression for the work done during the adiabatic expansion of an ideal gas.

(b) State Boyle's Law and Charles' Law and prove that the characteristic gas equation $P_v = mRT$.

(c) A gas engine has a piston dia 150 mm, length of stroke 400 mm and mean effective pressure 5·5 kgf/cm^2. The engine makes 120 explosions per minute. Determine the mechanical efficiency of the engine, if its BP is 5 kW.

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

(a) Explain briefly with the help of a neat diagram, vapour absorption system of refrigeration.

(b) Draw a line diagram of an air-conditioning system required in winter season. Explain the working of different components in the circuits.

(c) A machine working on a carbon cycle operates between 305 K and 260 K. Determine COP when it is operated as (i) a refrigerating machine, (ii) a heat pump, and (iii) a heat engine.

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

(a) A resistance R_A of 3 ohms in parallel with R_B produces a current of 3 amp when connected across a 6 V battery. Find the following :

(i) Current through R_A and R_B

(ii) The resistance of R_B

(iii) What resistance R_X must be put in series with R_{AB} combination to reduce the current to 2 amp ?

(b) Explain about the energy stored in a charged capacitor.

(c) A fluorescent lamp may be considered to be pure resistance. A 40 W lamp is designed to operate at a voltage of 130 V at 50 Hz. The lamp in series with a choke coil (which may be considered as pure inductor), is connected across a 220 V, 50 Hz supply. Calculate the required value of inductance of the choke coil.

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

(a) Deduce the emf equation of a transformer.

(b) A long shunt compound generator supplies a load current of 50 amperes at 220 volts. Shunt field resistance is 110 ohms. Series field resistance is 0·01 ohm and armature resistance is 0·02 ohms. Find the emf generated and power developed in the armature. Take contact drop per brush as 1·5 volts.

(c) A 240 V D.C. shunt motor has an armature resistance of 0·10 ohms and a field resistance of 400 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 of the motor to 1200 r.p.m. ? Assume the armature current remaining same and magnetisation curve is a straight line.