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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

00085 **December, 2014**

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 questions. *14×1=14*

(a) A process in which no heat exchange takes place between system and surrounding is called

(i) Isobaric process

(ii) Isothermal process

(iii) Adiabatic process

(iv) Polytropic process

(b) C.O.P. of a refrigerator is denoted by

(i) $\frac{\text{Heat Absorbed}}{\text{Work Supplied}}$

(ii) $\frac{\text{Heat Removed}}{\text{Work Supplied}}$

(iii) $\frac{\text{Work Supplied}}{\text{Heat Removed}}$

(iv) $\frac{\text{Heat Absorbed}}{\text{Time Consumed}}$

(c) A machine generates 0·95 BTU/S of energy. The equivalent power of this machine will be

(i) 2 kW

(ii) 1 kW

(iii) 0·5 kW

(iv) 3 kW

(d) Compression ratio of a diesel engine is

(i) 5 : 1

(ii) 10 : 1

(iii) 15 : 1

(iv) 25 : 1

(e) Which one of the following is ***not*** a solid fuel ?

(i) Bituminous Coal

(ii) Lignite Coal

(iii) Both the above

(iv) Natural Gas

(f) I.H.P. of an Internal Combustion Engine is

(i) BHP – FHP

(ii) FHP + BHP

(iii) $\frac{\text{FHP}}{\text{BHP}}$

(iv) $\frac{\text{BHP}}{\text{FHP}}$

(g) Commercially refrigerant NH_3 is identified by a number

(i) R170

(ii) R600

(iii) R717

(iv) R744

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

(i) double

(ii) half

(iii) one-fourth

(iv) same

(i) In RLC circuit, in an inductor phase angle

(i) the current leads the voltage by $\pi/2$.

(ii) the voltage leads the current by $\pi/2$.

(iii) the voltage leads the current by π.

(iv) both are in same phase

(j) Which statement is true in case of three-phase star connection ?

(i) $V_L = V_P$

(ii) $V_L = \sqrt{3}\, V_P$

(iii) $\sqrt{3}\, V_L = V_P$

(iv) $V_L = 3\, V_P$

(k) In case of a step-up transformer, voltage transformation ratio (K) of secondary voltage to primary voltage will be

(i) 1

(ii) < 1

(iii) > 1

(iv) 2

(l) S.I. unit of magnetic field is

(i) Farad

(ii) Henry

(iii) Volt

(iv) Tesla

(m) Capacitance of any capacitor is

(i) directly proportional to the area of plate.

(ii) inversely proportional to the thickness of dielectric.

(iii) Both (i) and (ii) are correct.

(iv) None of the above

(n) Which conductor is used as a heating element in electrical heater ?

(i) Carbon

(ii) Copper

(iii) Tungsten

(iv) Nichrome

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

(a) Classify the Internal Combustion engines. Compare Petrol and Diesel engines with suitable examples. 7

(b) An engine has a specific fuel consumption of 315 kg/BP/hr and the calorific value of the fuel is 46×10^3 J/kg with the brake power 2·51 kW. Find the thermal efficiency. If compression ratio is 6, find the relative efficiency. Assume value of $\nu = 1{\cdot}4$. 7

(c) Distinguish between a lift and an escalator. Write the applications of rotary cranes. 7

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

(a) What do you mean by a refrigerant ? A Carnot cycle machine operates between the temperature limit of $T_1 = 40°C$ and $T_2 = -20°C$. Determine the C.O.P. when it operates as 7

(i) a refrigeration machine

(ii) a heat pump

(b) Air having a mass of 1·82 kg at a pressure of 0·8 MPa occupies a volume of 0·283 m^3. Calculate the final temperature, work done, heat absorbed or rejected by this air if it expands to volume = 1·415 m^3 adiabatically. 7

(c) A single cylinder four-stroke diesel engine, having swept volume of 880 × 10^{-6} m^3 is tested at 300 rpm. When a braking torque of 60 Nm is applied, analysis of the indicator diagram results in mean effective pressure of 0·8 MPa. Calculate the BP and mechanical efficiency. 7

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

(a) In the circuit given in figure 1, find

(i) the value and direction of current in the 10 ohm resistance, and

(ii) the current supplied by each battery. 7

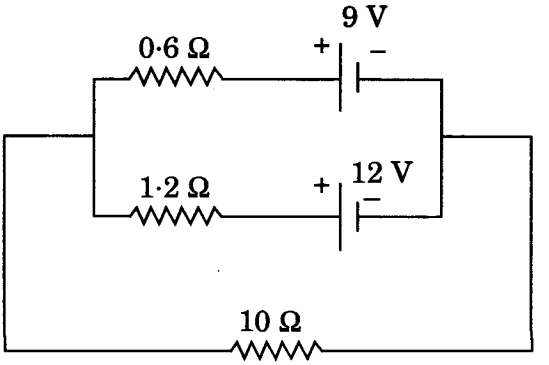

Figure 1

(b) Explain any ***two*** of the following : $2 \times 3\frac{1}{2} = 7$

(i) Eddy currents and Hysteresis losses

(ii) Lenz's Rule and Faraday's Law

(iii) Mutual and Self induction

(c) A 50 μF capacitor is charged from 200 V supply. After being disconnected it is immediately connected in parallel with a 40 μF capacitor. Find 7

(i) the PD across the combination,

(ii) the energy stored before connection, and

(iii) the energy stored after connection.

5. Attempt any ***two*** of the following :

(a) Describe in brief the working of a D.C. Generator. Draw an O.C.C. curve of a D.C. Generator. 7

(b) A long shunt compound generator supplies a load current of 50 amperes at 230 volts. Shunt field resistance is 110 ohms. Series field resistance is 0·01 ohm and armature resistance is 0·02 ohm. Find the e.m.f. generated and the power developed in the armature. Take contact drop per brush as 1·0 volt. 7

(c) An electrically driven pump lifts 15 tonnes/minute of water to a height of 20 metres. Assuming an efficiency of 60% for the pump, calculate 7

(i) the motor output in kW,

(ii) the cost of running the pump for 3 hr/day for 30 days, if the rate of electrical energy is ₹ 3·50 per unit.