

03237

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

**Term-End Examination**

**June, 2011**

**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. **1x14=14**
- (a) If the temperature remains constant, the volume of the given mass of a gas is inversely proportional to the pressure. This is known as :
- (i) Charle's Law
- (ii) Boyle's Law
- (iii) Joule's Law
- (iv) Gay - Lussac's Law

(b) 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

(c) The air standard efficiency of an otto gas is given by :

$$(i) \quad 1 - \frac{1}{r(r-1)} \quad (ii) \quad 1 + \frac{1}{r(r+1)}$$

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

Where  $r$  = compression ratio  $r = \frac{C_p}{C_v} =$

ratio of specific heat at constant pressure and constant volume.

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

- (i) Indicated power
- (ii) Brake power
- (iii) Fractional power
- (iv) None of above

- (e) The ratio of clearance volume to swept volume is called :
- (i) Cut off ratio
  - (ii) Expansion ratio
  - (iii) Clearance ratio
  - (iv) None of these
- (f) In a vapour compression system, the lowest temperature during the cycle occurs after :
- (i) Compression
  - (ii) Condensation
  - (iii) Expansion
  - (iv) Evaporation
- (g) Which of the following refrigerant is highly toxic and flammable :
- (i) Amonia
  - (ii) Carbon dioxide
  - (iii) Sulpher dioxide
  - (iv) Freon - 12
- (h) In series L.C.R. a.c. circuit, the phase angle between current and voltage is :
- (i)  $\pi/2$
  - (ii)  $\pi$
  - (iii) Any angle between 0 and  $\pi/2$
  - (iv) Any angle between 0 and  $\pm \pi/2$

(i) Four conductors of equal length and of resistance  $20 \Omega$  each are connected in the form of a square. The equivalent resistance between two opposite corners of the square is :

(i)  $2.5 \Omega$

(ii)  $10 \Omega$

(iii)  $20 \Omega$

(iv)  $40 \Omega$

(j) SI unit of capacitance is :

(i) Farad

(ii) Faraday

(iii) Henry

(iv) Tesla

(k) The total resistance  $R_T$  of the ammeter will be :

(i)  $\frac{(S + G_R)}{S G_R}$

(ii)  $\frac{S(S + G_R)}{G_R}$

(iii)  $\frac{S G_R}{(S + G_R)}$

(iv)  $\frac{G_R(S + G_R)}{S}$

(l) Form factor of a Sinusoidal wave is :

(i)  $\frac{\text{Average Value}}{\text{r.m.s. Value}}$

(ii)  $\frac{\text{r.m.s. Value}}{\text{Average Value}}$

(iii)  $\frac{\text{Peak Value}}{\text{r.m.s. Value}}$

(iv)  $\frac{\text{r.m.s. Value}}{\text{Peak value}}$

(m) The resistance of an ideal voltmeter is :

(i) 100  $\Omega$

(ii) 500  $\Omega$

(iii) Infinity

(iv) Zero

(n) In a Loss Less transformer, an alternating current of 2A is flowing in the primary coil, the number of turns in primary and secondary coils are 100 and 20 respectively. The value of current in the secondary coil is :

(i) 10 Amperes

(ii) 5 Amperes

(iii) 0.4 Amperes

(iv) 0.08 Amperes

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

- (a) Explain the following terms as applied to I.C. Engines.
- (i) Bore
  - (ii) Stroke
  - (iii) T.D.C.
  - (iv) B.D.C.
  - (v) Clearance volume
  - (vi) Swept volume
  - (vii) Compression ratio
- (b) Discuss the working of a two stroke petrol engine with the help of neat sketch.
- (c) What is lift ? How do you classify them ? Describe any one in brief.

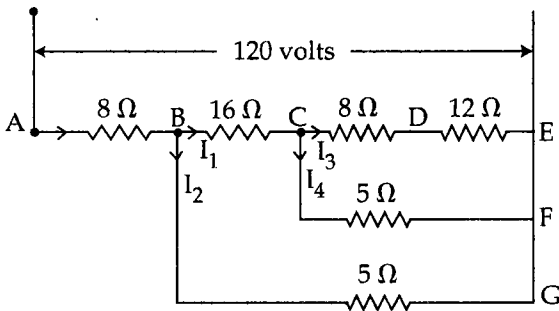
3. Attempt *any two* of the following. 2x7=14

- (a) Describe the vapour absorption refrigeration system with a neat sketch.
- (b) A gas engine working on otto cycle has a cylinder diameter 178 mm and stroke of 254 mm. The Clearance volume is  $1.5 \times 10^6 \text{mm}^3$ . Calculate the air standard efficiency.
- (c) An I.C. engine rotates at 2400 r.p.m. The four stroke engine has a cylinder bore diameter of 100 mm. and crank radius of 100 mm. From indicator diagram mean effective pressure is found as 100 kPa. If mechanical efficiency is 80%. Find brake power of the engine.

4. Attempt *any two* of the following.

2x7=14

- (a) In the circuit shown in the figure determine the current flowing through the 12 Ohms resistance.



- (b) Find the magnitude of e.m.f. induced in a 200 turns coil with cross - sectional area of  $0.2 \text{ m}^2$ . If the magnetic field through the coil changes from  $0.20 \text{ Wb/m}^2$  to  $0.70 \text{ Wb/m}^2$  at a uniform rate over the period of 0.05 sec.
- (c) Determine the capacitance of a parallel plate capacitor composed of square thin foil sheet of side 20 cm and separated by a glass dielectric 0.4 cm thick with relative permittivity 6.

5. Attempt *any two* of the following.

2x7=14

- (a) Deduce the expression for e.m.f. induced by operation of a d.c. generator

A d.c. shunt generator has an induced voltage of 240 Volts on open circuit. When the machine is loaded the terminal voltage is 230 Volts. The field resistance is  $46 \Omega$  and the armature resistance is  $0.05 \Omega$ . Determine the load current.

- (b) A 220 Volts d.c. series motor runs at 500 r.p.m., when taking a current of 25 amperes. The resistance of the armature is  $0.5 \Omega$  and that of the field is  $0.3 \Omega$ . If the current remains constant, calculate the necessary additional resistance in series with armature to reduce the speed to 250 r.p.m.

- (c) How much power will be required to light a factory in which 250 lamps, each taking 1.4 amperes at 230 Volts are used. Calculate the cost of energy @ Rs 2/- per unit for 24 hours.
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