

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

**Term-End Examination  
June, 2012**

**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 following multiple choice objective type questions. **14x1=14**
- (a) Which of the following is a compression ignition engine ?
- (i) Diesel engine
  - (ii) Petrol engine
  - (iii) Gas engine
  - (iv) None of the above
- (b)  $PV^n = \text{constant}$ , which of the following is correct for the equation.
- (i)  $n=0$ , if it is isothermal process.
  - (ii)  $n=1$ , if it is constant pressure process
  - (iii)  $n=r$ , if it is adiabatic process.
  - (iv)  $n=1.5$ , if it is constant volume process.

- (c) The function of a carburettor of an S.I. engine is to control.
- (i) Air - fuel ratio.
  - (ii) Amount of mixture.
  - (iii) Air - fuel ratio and amount of mixture.
  - (iv) Compression ratio.
- (d) Otto cycle is also known as :
- (i) constant pressure cycle
  - (ii) constant volume cycle
  - (iii) constant temperature cycle
  - (iv) constant entropy cycle
- (e) Carnot cycle consists of :
- (i) Two constant volume and two reversible adiabatic process.
  - (ii) Two isothermal and two reversible adiabatic process.
  - (iii) Two constant pressure and two reversible adiabatic process.
  - (iv) one constant volume, one constant pressure and two reversible adiabatic process.
- (f) The thermal efficiency of a two stroke cycle engine is \_\_\_\_\_ a four stroke engine.
- (i) Equal to
  - (ii) Less than
  - (iii) Greater than
  - (iv) None of the above

- (g) A two stroke cycle engine \_\_\_\_\_ the number of power strokes as compared to four stroke engine at the same speed.
- (i) Half
  - (ii) Same
  - (iii) Double
  - (iv) Four times
- (h) The law that governs the force between electrical charges is called.
- (i) Ampere's Law
  - (ii) Coulomb's Law
  - (iii) Faraday's Law
  - (iv) Ohm's Law
- (i) Unit of flux density is
- (i) Coulomb/m<sup>2</sup>
  - (ii) Coulomb/m<sup>3</sup>
  - (iii) Coulomb
  - (iv) Coulomb/m
- (j) In three phase star connection, The phase voltage is equal to :
- (i) Line voltage  $\times \frac{1}{\sqrt{3}}$
  - (ii) Line voltage  $\times \sqrt{3}$
  - (iii) Line voltage  $\times \frac{1}{\sqrt{2}}$
  - (iv) Line voltage  $\times \sqrt{2}$

- (k) Transformer :
- (i) Transforms energy
  - (ii) Transforms frequency
  - (iii) Transforms voltage
  - (iv) Generates emf
- (l) D.C. Generator works on the principle of :
- (i) Faraday's Law
  - (ii) Lenz's Law
  - (iii) Biot-Savart's Law
  - (iv) Kirchhoff's Law
- (m) Current in a conductor is due to :
- (i) Motion of free electrons in it.
  - (ii) Motion of '+ve ions
  - (iii) Free electrons and holes
  - (iv) Protons
- (n) Energy stored in an inductor is :
- (i)  $\frac{1}{2} L^2 I$
  - (ii)  $\frac{1}{2} C V^2$
  - (iii)  $\frac{1}{2} L I^2$
  - (iv)  $\frac{1}{2} V I^2$

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

- (a) Define following technical terms w.r.t. an IC engine.
- (i) Indicated power
  - (ii) Brake power
  - (iii) Mechanical efficiency
  - (iv) Air standard efficiency

- (v) Indicated thermal efficiency
  - (vi) Brake thermal efficiency
  - (vii) Volume efficiency
- (b) A gas engine working an otto cycle has a cylinder diameter 178mm and stroke length of 254mm. The clearance volume is  $1.5 \times 10^6 \text{mm}^3$ . Calculate the air standard efficiency.
- (c) Explain working of 4 - stroke otto cycle with the help of (P - V) diagram.

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

- (a) Explain briefly with the help of a neat diagram vapour absorption system of refrigeration.
- (b) Draw a line diagram of air conditioning system required in winter season. Explain the working of different components in the circuit.
- (c) A machine working on a Carnot Cycle operates between  $305^\circ\text{k}$  and  $260^\circ\text{k}$ . Determine C.O.P., when it is operated as
  - (i) a refrigerating machine
  - (ii) a heat pump and
  - (iii) a heat engine

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

(a) A current of 20 amperes flows through two resistors A and B joined in series across a potential difference is 0.2 volts and across B, it is 0.3 volts. Find how the same current will divide between A and B when they are joined in parallel.

(b) An iron ring having mean diameter 25cm and cross-sectional area  $2\text{cm}^2$  is uniformly wound with 400 turns and carries a current of 5A. The permeability of iron is 450. *Calculate :*

(i) Magnetomotive force

(ii) Reluctance

(iii) Flux

(c) State Faraday's Laws of electromagnetic induction.

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

(a) Find the magnitude of e.m.f. induced in a 100 turn coil with cross-sectional area of  $0.16\text{m}^2$ , if the magnetic field through the coil changes from  $0.10\text{ Wbm}^{-2}$  to  $0.70\text{ Wbm}^{-2}$  at uniform rate over a period of 0.02 seconds.

- (b) A  $50 \mu\text{F}$  capacitor is charged from 200V supply. After being disconnected, it is immediately connected in parallel with  $30\mu\text{F}$  capacitor. Find
- (i) P.D. across the combination.
  - (ii) Energy stored before connection and
  - (iii) Energy stored after connection.
- (c) A 240v D.C. Shunt motor has an armature resistance of 0.10 ohms and field resistance of 400 ohms. The normal speed is 1000 r.p.m and armature current is 50 amperes. What additional resistance should be added in the field to increase the speed to 1200 r.p.m. ? Assume that the armature current remaining the same and magnetisation curve is a straight line.
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