

B.Tech. Degree I & II Semester Examination in Marine Engineering May 2014

MRE 1107 FUNDAMENTALS OF ENGINEERING I

(Use separate answer books for Part A and Part B)

PART A: MECHANICAL ENGINEERING

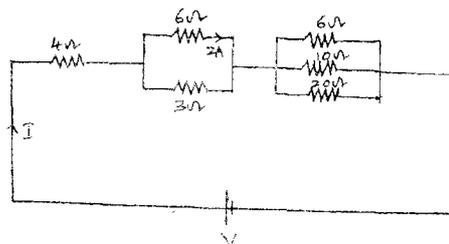
Time : 3 Hours

Maximum Marks : 100

- I. (a) State and explain the two statements of II Law of thermo dynamics. (6)
 (b) Distinguish between 2-stroke and 4-stroke engines. (10)
- OR**
- II. (a) Sketch and explain a carnot cycle. (6)
 (b) A carnot engine operates between two reservoirs at temperatures T_1 and T_2 K. The work output of the engine is 0.6 times the heat rejected. The difference between the source temperature and sink temperature is 200°C . Calculate the source temperature, sink temperature and efficiency. (10)
- III. Derive an expression for the air standard efficiency of a diesel cycle. Clearly indicate the assumptions made. (17)
- OR**
- IV. A gas engine working on otto cycle has a cylinder diameter of 10mm and a stroke of 150mm. If the clearance volume of the engine is 250cm^3 , find its air standard efficiency. (17)
- V. (a) Distinguish between water tube and fire tube boilers. (7)
 (b) Determine specific volume and enthalpy of steam at 10 bar pressure and 0.9 dryness fraction. (10)
- OR**
- VI. Explain in detail the various factors influencing boiler efficiency. (17)

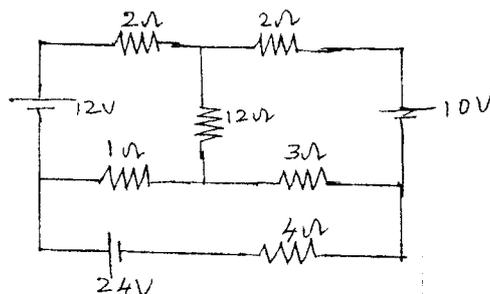
PART B: ELECTRICAL ENGINEERING

- I. (a) State and explain superposition theorem. (6)
 (b) The current in 6Ω resistor of the network shown below is 2A. Determine: (10)
- (i) Current in all branches
 - (ii) Supply voltage
 - (iii) Power developed in each branch
 - (iv) Total power
 - (v) Equivalent resistance



OR

- II. (a) State and explain Thevenin's theorem. (6)
 (b) Using Maxwell's circulating current theorem determine the current in the 4Ω branch in the circuit shown below: (10)



- III. (a) Obtain an expression for energy stored in a magnetic field. (5)
 (b) A coil is wound uniformly with 300 turns over a steel ring of relative permeability 900 having a mean circumference of 40cm and cross sectional area 5cm^2 . If the coil has a resistance of 100Ω and is connected to 250V dc supply. Calculate: (12)
- The coil mmf
 - The field strength
 - Total flux
 - Reluctance of the ring
 - Permeance of the ring

OR

- IV. (a) Derive an expression for equivalent capacitance when C_1 , C_2 and C_3 are connected in (i) Parallel (ii) Series (5)
 (b) Two coils having 30 and 600 turns respectively are wound side by side on a closed iron circuit of section 100cm^2 and mean length of 150cm. A current in first coil grows steadily from zero to 10A in 0.01sec. Find the induced emf in other coil. Permeability of iron is 2000. (12)

- V. (a) An alternating current is given by $i = 141.4 \sin 314t$. Find (4)
 (i) Maximum value
 (ii) Frequency
 (iii) Time period
 (iv) Instantaneous value when t is 3msec
 (b) Prove that the power consumed by a pure capacitive circuit is zero. (3)
 (c) A series circuit having $R = 100\Omega$, $L = 0.12\text{H}$ and $C = 28.27\mu\text{F}$ is fed from a 100V, 50Hz supply. Find the current, active power, impedance, rms values of voltage across the resistance, inductance and capacitance. (10)

OR

- VI. (a) Derive the relationship between phase voltage and line voltage in a three phase star connected system. Draw the vector diagram. (7)
 (b) Two watt meters connected to measure the input to balanced three phase circuit indicate 2500W and 500W respectively. Find the power factor total power of the circuit (10)
 (i) when both readings are positive
 (ii) when the latter reading is obtained after reversing the connections to the current coil.