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B.Tech. Degree I &II Semester Examination in Marine Engineering May 2017

MRE 1107 FUNDAMENTALS OF ENGINEERING I
(2013 Scheme)

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

Time: 3 Hours   Maximum Marks: 100

SECTION A : MECHANICAL ENGINEERING

I. (a) State and explain zeroth law of thermodynamics.   (6)
    (b) Derive expressions for heat transfer and work done in the following   (10)
         thermodynamic processes.
         (i)   Constant volume process.
         (ii)   Constant pressure process.
         (iii) Adiabatic process.

OR

II. (a) Write notes on: (i) Cooling system   (ii) Lubricating system of IC engines.   (6)
    (b) Briefly describe the following.   (10)
         (i)   Working of two stroke petrol engine.
         (ii)   Working of MPFI engines.

III. (a) Derive an expression for air standard efficiency of a diesel cycle.   (7)
     (b) For a diesel cycle, the following data were observed.   (10)
          Air inlet pressure and temperature = 1 bar and 300 K
          Compression ratio   = 20
          Cutoff ratio   = 2
          Calculate the temperature at all points in the cycle, net power output and
          thermal efficiency of the cycle.

OR

IV. (a) Write notes on (i) Mechanical efficiency.   (7)
                          (ii) Energy balance.
    (b) An engine of 250 mm bore and 375 mm stroke works on Otto cycle. The   (10)
         clearance volume is 0.00283 m^3. The initial temperature and pressure are
         40°C and 1 bar respectively. If the maximum pressure is limited to 24 bar,
         find (i) The air standard efficiency (ii) Mean effective pressure of the cycle.

(P.T.O.)

V. (a) Explain the concept of enthalpy and entropy.   (7)
    (b) Calculate the state of steam, <u>using steam table</u>, ie., wet, dry or super heat for   (10)
         the given conditions.
         (i)   Pressure 15 bar and specific volume 0.125 m^3 / kg.
         (ii)   Pressure 10 bar and temperature 225°C.
         (iii) 5016 kJ heat given to 2 kg of water to generate steam at 30 bar.

                                              OR

VI. (a) Differentiate between boiler mountings and boiler accessories.   (7)
    (b) A boiler generates 250 kg of steam per hour at 11 bar and 0.97 dry when   (10)
         feed water is supplied at 100°C. The coal fired is 2000 kg/hr and its colorific
         value is 27.4 MJ/kg.
         Determine (i) Equivalent evaporation.
   (ii) The thermal efficiency of the boiler.

                    SECTION B : ELECTRICAL ENGINEERING

I.   (a) State and explain type of voltage sources with their respective symbols.   (6)
     (b) Using superposition theorem find the current in the resistor R_5 in the circuit   (10)
          shown in fig (1). All resistors in ohms.

fig:(1)
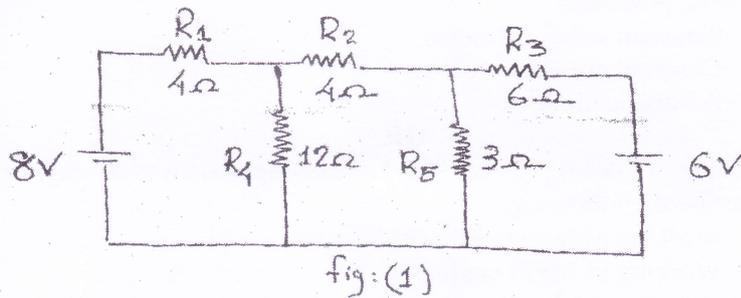
                                              OR

II. (a) State and explain Kirchoff's law.   (6)
     (b) State Thevenin's theorem and find V_{Th} and R_{Th} across load resistance R_L in   (10)
          the following circuit shown in fig (2). All resistors are in ohms.

fig:(2)
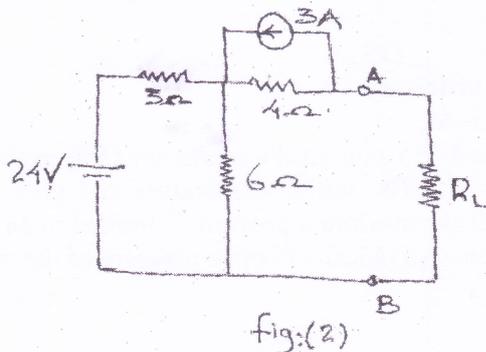
III.	(a)	State and explain Coloumb's law.	(6)
	(b)	State and explain Faraday's law.	(6)
	(c)	A potential difference of 1000V is applied across the plates of a parallel plate capacitor. The plates are separated by a dielectric of thickness 2mm and relative permittivity of 5.5. Area of each plate is 350cm^2. Calculate the capacitance.	(5)

OR

IV.	(a)	Derive the expression for potential due to a point charge.	(7)
	(b)	An iron ring has a cross section of 3cm^2 and mean diameter of 25cm. An air gap of 0.4mm has been cut across the section of the ring. The ring is wound with a coil of 200 turns through which a current of 2A is passed. If the total magnetic flux is 0.24m Wb, find the relative permeability of iron assuming no magnetic leakage.	(10)

V.	(a)	Explain the generation of alternating voltage.	(7)
	(b)	Derive the relationship between phase voltage and line voltage in $3\varnothing$ star connected system and thereby obtain $3\varnothing$ power equation.	(10)

OR

VI.	(a)	Explain phenomenon of resonance in series circuit. What is the Q-factor of the circuit?	(7)
	(b)	Two watt meters have been used to measure the power input to a 100 kW 400 V, 3-$\varnothing$ motor. The watt meter readings at full load condition are 75kW and 40 kW. Calculate : (i) the input to the motor (ii) power factor of the motor at full load (iii) efficiency of motor at full load.	(10)

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