

COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY

**B.TECH. DEGREE I & II SEMESTER SUPPLEMENTARY EXAMINATION IN
MARINE ENGINEERING JUNE 2020**

MRE 1107 FUNDAMENTALS OF ENGINEERING-I
(2013 Scheme)

Time: 25 Minutes [for Answering and Scanning/Uploading the page of the Answer Sheet]
per module

Max. Marks: 11 per module

INSTRUCTIONS

1. You have to be available in Google Meet on demand by the faculty.
2. You have to share your '**live location**' to the faculty before uploading the answer sheet.
3. You have to answer only one question per module.
4. Answer may not exceed one page of an A4 size paper in a standard handwriting, as far as possible.
5. If at all an answer goes beyond one page, (due to your handwriting) another page can also be used. In such a situation, the page number should be given as 1/2, 2/2.
6. You have to put dated signature along with Register Number, Subject Code, Module/Group Number (as given in the Question Paper) in each page.
7. You have to put the Question Number correctly.
8. After answering the question, you have to scan and upload the answer page.

PART A
MECHANICAL ENGINEERING

MODULE - I
(Answer **ANY ONE** question)

- I(1). (a) A certain quantity of air has a volume of 0.028 m^3 at pressure of 1.25 bar and 25°C . It is compressed to a volume of 0.0042 m^3 according to the law $PV^{1.3} = \text{Constant}$. Find the final temperature and work done during compression. Also determine the reduction in pressure at a constant volume required to bring the air back to its original temperature. (6)
- (b) Explain Battery ignition system with the help of a neat sketch. (5)

OR

- I(2). (a) A cylinder contains 0.5 m^3 of air at 1 bar and 90°C . The air is compressed to a volume of 0.125 m^3 , the final pressure being 6 bar. Determine (6)
- (i) the mass of air
 - (ii) the index of compression
 - (iii) the increase in internal energy of air
 - (iv) Work done during the process.
- (b) Compare Air cooling and liquid cooling used in IC engines. (5)

PART A
MECHANICAL ENGINEERING

MODULE - II

(Answer *ANY ONE* question)

- II(1). (a) Show that the efficiency of Otto cycle increases with increase in compression ratio. (4)
- (b) The peak pressure in an Otto cycle is 210 N/cm^2 , with a compression ratio of 5 and minimum pressure of 10 N/cm^2 , determine (i) Thermal efficiency (8)
(ii) Mean effective pressure. Assume the working substance as air with $\gamma = 1.4$.

OR

- II(2). (a) Show that the efficiency of Diesel cycle is a function of compression ratio, cut- off ratio and the ratio of specific heats. (4)
- (b) Find the percentage loss in the ideal efficiency of a diesel engine with compression ratio 15, by delaying the fuel cut-off from 5 to 10% of the stroke. (8)

PART A
MECHANICAL ENGINEERING

MODULE - III

(Answer *ANY ONE* question)

- III(1). (a) What are the advantages obtained if superheated steam is used in steam prime movers? (5)
- (b) Draw and explain the P-T diagram for a pure substance. (7)

OR

- III(2). (a) Compare Boiler Mountings and Accessories with the help of examples. (5)
- (b) In a boiler test 1250 kg of coal are consumed in 24 hours. The mass of water evaporated is 13000 kg and the mean effective pressure is 7 bar. The feed water temperature was 40°C ; heating value of coal is 30000 kJ/kg. The enthalpy of 1 kg of steam at 7 bar is 2570.7 kJ. Determine: (i) Equivalent evaporation per kg of coal
(ii) Efficiency of the boiler.

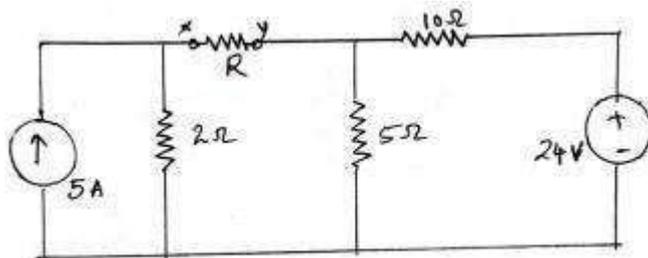
PART A
MECHANICAL ENGINEERING

MODULE - III
(Answer *ANY ONE* question)

- III(1). (a) What are the advantages obtained if superheated steam is used in steam prime movers? (5)
- (b) Draw and explain the P-T diagram for a pure substance. (7)
- OR**
- III(2). (a) Compare Boiler Mountings and Accessories with the help of examples. (5)
- (b) In a boiler test 1250 kg of coal are consumed in 24 hours. The mass of water evaporated is 13000 kg and the mean effective pressure is 7 bar. The feed water temperature was 40°C; heating value of coal is 30000 kJ/kg. The enthalpy of 1 kg of steam at 7 bar is 2570.7 kJ. Determine: (i) Equivalent evaporation per kg of coal
(ii) Efficiency of the boiler.

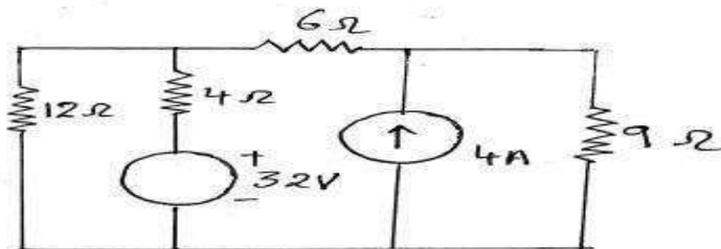
PART B
ELECTRICAL ENGINEERING
MODULE – IV
 (Answer *ANY ONE* question)

IV(1). Find the value of 'R' such that it draws maximum power from the given circuit: (11)



OR

IV(2). Find current in 12Ω by Nodal analysis: (11)



PART B
ELECTRICAL ENGINEERING

MODULE - V

(Answer *ANY ONE* question)

- V(1). A $9\mu\text{F}$ capacitor is connected in series with a parallel combination of two capacitors of values $4\mu\text{F}$ and $2\mu\text{F}$ respectively. Determine the capacitance of the combination. If potential difference of 20V is maintained across the combination, determine the charge on $9\mu\text{F}$ capacitor and the energy stored in the $4\mu\text{F}$ capacitor. (12)

OR

- V(2). A mild steel ring of 30cm mean circumference has a cross-sectional area of 6 cm^2 and has a winding of 500 turns on it. The ring is cut through at a point so as to provide an air-gap of 1mm in the magnetic circuit. It is found that a current of 4 A in the winding produces a flux density of 1 Weber/m^2 in the air gap. Find relative permeability of mild steel and inductance of the winding. (12)

PART B
ELECTRICAL ENGINEERING

MODULE - VI

(Answer *ANY ONE* question)

- VI(1). A coil of resistance $10\ \Omega$ and inductance 0.02H is connected in series with another coil of resistance $6\ \Omega$ and inductance 15mH across a $230\ 50\text{ Hz}$ supply. Find: Impedance of circuit and voltage drop across each coil. (12)

OR

- VI(2). Three phase star-connected load when supplied from a 400V , 50Hz source takes a line current of 10A at 66.86 degree with respect to its line voltage. Calculate: (i) Impedance (ii) power factor and active power consumed. Draw phasor diagram. (12)
