

B.E. ELECTRICAL ENGINEERING (PART TIME)
5TH YEAR 2ND SEMESTER EXAMINATION 2017 (OLD)

ENERGY SYSTEMS

Time: Three hours

Full Marks: 100

(50 marks for each part)

Use separate answer script for each part.

PART I

Answer **any five** questions.

Figures in the margin indicate full marks

1. What are the properties of coal to be considered when selecting a coal for a given application? Explain any three of them. (10)
- 2.(a) Derive the formulae to calculate the theoretical air-fuel ratio for a given sample of coal. (6)
- (b) The moisture and ash fractions of a sample coal are 4 and 5 per cent respectively. The dry ash-free ultimate analysis of the coal is 83.1%C, 5.6%H₂, 7.4% O₂, 2.1%N₂, 1.9% S and HHV = 34,608 KJ/Kg. Calculate the theoretical air-fuel ratio for the sample of coal. (4)
- 3.(a) What do you understand by the following terms in the context of a gaseous fuel: (i) cracking (ii) Octane number (iii) Cetane number (6)
- (b) Distinguish between natural gas and water gas. (4)
4. What is meant by mole fraction of element present in a gaseous fuel? How to calculate theoretical dry molar air-fuel ratio of a specimen gaseous fuel? (2+8)
- 5.(a) What do you understand by the term 'mass defect'? What is 'binding energy'? What is the importance of binding energy in nuclear power generation? (2×3=6)
- (b) Assuming mass of proton and neutron as 1.007825 A.M.U and 1.008665 A.M.U respectively, calculate the average binding energy per Nucleon for Nickel isotope, ${}_{28}^{59}\text{Ni}$. (4)
- 6.(a) Discuss about co generation with suitable example. (6)
- (b) Distinguish between a cogeneration power plant and a combined cycle power plant. (4)
- 7.(a) What is celestial type energy source? Give two examples. (3)
- (b) Write about major energy policies of India. (7)
- 8.(a) Discuss operating principle of compressed air pumped storage system with the help of a suitable schematic diagram. (6)
- (b) Discuss why pumped storage system is economical. (4)

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Ref. No. Ex /EE/5/T/523A/2017(old).....

B E (ELECTRICAL) 5th Year, 2nd Sem EXAMINATION, 20 17(1st/2nd Semester/Repeat/Supplementary/Spl. Supplementary/Old/Annual/Bi-Annual)SUBJECT Energy Systems
(Name in full)

PAPER

Full Marks 30/ 100

Time : Two hours/Three hours/Four hours/Six hours

(15/50 marks for each part)

Use a separate Answer-Script for each part

No. of questions	Part II Answer any three from the following. Two marks for neatness.	Marks
Q1 a) b)	With neat diagram explain the principle of wind energy conversion and hence derive the expression for power extracted from wind. Explain the term drag, lift, and angle of attack in case of a wind turbine. A Horizontal axis wind turbine has the following data: Speed of wind = 08 m/s at 1 atm and 15°C Diameter of rotor = 100 m Speed of rotor = 40 rpm Calculate the maximum possible torque produced at the shaft.	10+6
Q2 a) b)	Explain how the variation of insolation and temperature affects the I-V characteristics of a solar cell. What are the different biomass energy resources and what is the energy yield from each of them?	8+8
Q3 a) b)	Explain the working of a Geothermal Power Plants. What are the merits and Demerits of geothermal energy? What are the basic subsystems of a wind turbine. With neat diagram explain the operation of Horizontal Axis wind Turbine.	8+8
Q4 a) b)	Write a note on properties desired for choice of materials for solar cell. Discuss the constraints in photovoltaic Power Generation With the help of schematic diagram explain the working of a closed cycle mode Ocean Thermal Energy Conversion system	8+8
Q5	Explain in details the following I) Down Draft Gasifier with neat diagram II) Electrical Storage system.	8+8