<table>
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<th>Q.No.</th>
<th>Question</th>
<th>M.M.</th>
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<td>1(a)</td>
<td>Explain the importance of non-conventional energy sources in the present context.</td>
<td>[06]</td>
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<td>1(b)</td>
<td>For solving the problem of increased energy demand evaluate the benefits of energy conservation as compared to increasing the generating capacity.</td>
<td>[06]</td>
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<tr>
<td>1'(a)</td>
<td>Under what conditions the storage of energy becomes necessary?</td>
<td>[04]</td>
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<td>1' (b)</td>
<td>Explain the technology of thermal energy storage.</td>
<td>[08]</td>
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<td>2(a)</td>
<td>Show the constructional details and describe the working of a flat plate collector. What are its main advantages?</td>
<td>[08]</td>
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<td>2(b)</td>
<td>Illustrate the concept of load mismatch in an SPV-load system.</td>
<td>[04]</td>
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<td>3(a)</td>
<td>Describe main features of various types of bio-fuels; indicate the required raw materials for each of them.</td>
<td>[06]</td>
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<td>3(b)</td>
<td>With the help of a neat diagram, explain the operation of a biomass thermal gasification plant. Which type of biomass can be converted to gas through this plant?</td>
<td>[06]</td>
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OR

3'(a) With the help of a neat diagram, explain the working of floating drum type biogas plant. [06]

3'(b) Enumerate the main advantages and disadvantages of fuel cells. [06]

4(a) What are the most favourable sites for installing of wind turbines? [04]

4(b) Evaluate the suitability of various types of generators for wind power generation. [08]

OR

4' (a) With the help of neat diagrams, explain the terms 'free' and 'relative' wind velocities, pitch angle and chord. [06]

4' (b) Following data were recorded for a three blade HAWT:
   Average free wind velocity at a standard height of 10 m = 8 m/s
   \[ \alpha = 0.14 \]
   Air density = 1.226 kg / m³
   Hub height from the ground = 100 m
   Rotor diameter = 80 m
   Downstream wind velocity is half that of upstream wind.

   Find:
   (i) Power available in wind.
   (ii) Power extracted by the turbine.
   (iii) Axial force on the turbine

5(a) Derive an expression for power available in ocean waves in kW / m. [06]

5(b) What do you understand by spring and neap tides? How are they caused? [06]
2013-14
B.TECH. (WINTER SEMESTER) EXAMINATION
(ARCHITECTURE/CIVIL/ELECTRICAL/CHEMICAL/ELECTRONICS/
MECHANICAL/COMPUTER/PETRO-CHEMICAL)
NON-CONVENTIONAL ENERGY (OPEN ELECTIVE)
ME-462

Maximum Marks: 60          Credits: 04          Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.        Question                                     M.M.
1(a) Explain the following terms:                         [06]
            (i) Green energy  (ii) External Costs of Energy  (iii) Energy farming
1(b) A person wants to start a biomass-briquetting plant and expects the sales revenue of
Rs 10 lakhs at the end of first year. In subsequent 5 years, sales are expected to increase
by Rs 1 lakh annually. The manufacturer has applied for a loan of Rs 40 lakhs from a
bank to finance the project. The bank’s policy requires that the loan must not exceed 85%
of the expected revenues. If the discount rate is 12%, will the manufacturer get the loan?

OR

1(b') State, some of the policy tools available to governments to encourage the society towards
cleaner alternatives of electricity production.

2(a) Explain: Clearness index and Threshold intensity of solar radiation. Obtain the relation
for the geometric factor ($R_b$) for tilted surface facing south, if the incidence angle for
solar radiation is given by

$$\cos \theta = \sin \delta \sin \varphi \cos \beta - \sin \delta \cos \varphi \sin \beta \cos \gamma + \cos \delta \cos \varphi \cos \beta \cos \omega$$
$$+ \cos \delta \sin \varphi \sin \beta \cos \gamma \cos \omega + \cos \delta \sin \beta \sin \gamma \sin \omega$$

2(b) A flat plate solar collector located at Aligarh ($27^0 54'N, 78^0 05'E$) is tilted at an angle
$40^0$ facing south. Calculate the total solar radiation incident on the collector on
February 10, 2014 at 10:30 A.M. (solar time). For horizontal surface with $I_h = 600$
W/m$^2$ and $I_d = 120$ W/m$^2$. Ground reflectance = 0.2. $\delta = 23.45 \sin [360 (284+n)/365]$. OR
A single glazed flat plate solar collector located at Delhi is tilted at 30° from the ground and facing due south. Calculate the overall heat loss coefficient for the following data:

Absorber plate size = 2 m x 1 m, air gap spacing between the absorber plate and glass cover = 25 mm, back and side insulations = 50 mm each with k_{insulation} = 0.05 W/m-K, emissivities of the absorber plate and glass cover are 0.9 and 0.88, respectively. Assume wind speed = 1.4 m/s and mean temperature of the absorber plate, glass cover and ambient air are 75°C, 45°C and 30°C, respectively. Nusselt number between two parallel plates \( Nu = 0.229 (Gr Pr \cos \beta)^{0.252} \) and wind heat transfer coefficient is given by Mc Adams relation: \( h_w = 5.7 + 3.8 V_w \).

The properties of air at 60°C are: \( k = 0.029 \) W/m-K, \( v = 18.97 \times 10^{-6} \) m²/s, \( Pr = 0.696 \).

3 Describe any two (02) of the following:
(i) solar thermal energy storage  (ii) solar refrigeration using vapour absorption system and (iii) solar photovoltaic system.

4(a) Using Blade Element theory, derive an expression for the aerodynamic power obtained from a three bladed wind turbine.

4(b) Give two examples of a VAWT with the help of neat diagrams.

OR

4(b') What are the factors affecting the distribution of wind energy on the surface of the earth, both globally and locally?

5 Answer any three (03) of the following questions:

(i) Calculate the maximum power extracted by a two way turbine installed in a basin of area "A" for a tidal range of "R" in a lunar day (24hr 48min)? How does pumping increase the output of the tidal plant?

(ii) Explain the operation of an Oscillating Water Column type wave energy plant with the help of a diagram.

(iii) What are the four types of geothermal resources? Name at least two sites of geothermal energy source in the world.

(iv) Discuss at least two types of Biomass Energy Conversion Technologies.
2013 – 14 (Graduating Paper)
B.TECH. (WINTER SEMESTER) EXAMINATION
OPEN ELECTIVE
STRUCTURE PROPERTY RELATIONSHIP
(PK – 428D)
Credits: 04

Maximum Marks: 60
Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.
Notation used have their usual meanings

1(a) Classify the polymers on the basis of (a). Intera-molecular forces (b). 05 Structure, (c). Stereo regularity.

Or

(a') What is the difference between copolymers and homo polymers? Explain types of copolymers with suitable examples. 05

(b) Differentiate between condensation and addition polymerization reactions with suitable examples. 05

(c) What is the difference between step and chain polymerization? Compare the growth of molecular weight with % conversion in step and chain polymerization. 05

2(a). What do you mean by mechanical properties of polymers? Explain the following terms with their units in MKS system.

Or

(a'). Why polymers are known as viscoelastic materials? Differentiate them with perfectly elastic materials. 05

(b). What do you mean by non-Newtonian fluids? What the difference is between shear strain and shear strain rate? Give the shear rate range for various polymer processing methods. 05

contd... 2
(c). What do you mean by Rheological Models? Explain the difference between Power Law Model and Truncated Power Law Model in light of shear rate range in viscometeric plot.

Or

(c'). Explain the phenomenon of Stress relaxation and Creep in viscoelastic materials.

3(a). Explain the response of a Hookean Solid, Newtonian Fluid and a Viscoelastic polymer to sinusoidal load with the help of stress – strain plot. Differentiate between storage modulus and loss modulus.

Or

(a'). What do you mean by transition temperatures in polymers? Other than glass transition temperature explain any other transition temperature. Briefly explain the factors affecting glass transition temperature.

(b). Explain the construction and working of Thermal Gravimetric Analyzer (TGA). Explain how you will relate the TGA curve with moisture removal, degradation and char formation stages.

(c). What do you mean by solubility parameter of a polymer, what is its unit? What are the conditions of two or more polymer forming a miscible or immiscible blend?

4(a). What do you mean by polarization of polymer? Explain the types of polarization in a dielectric (polymer). Explain the type of polarization a non polar polymer will undergo and why?

Or

(a'). Explain the various electrical properties required from a polymer insulation containing microwave signals.

(b). Give the expression for electrical field acting on an atom/ molecule. Explain the phenomenon of and how electrical relaxation time it depends upon the radius of molecule and viscosity of system according to Debye?

(c). What will happen to a polymer subjected to a changing electrical field? Differentiate between dielectric dissipation factor \( \tan \delta \) and dielectric loss factor \( \varepsilon'' \).

Or

(c'). Explain the dependency of dielectric constant \( \varepsilon \) on internal viscosity of polymer, temperature, frequency and presence of dipole in polymer structure.
Duration 3 hours  
Credits - 04  

Instructions:  
Attempt all the questions.  
Answer the questions in order of sequence on your answer sheet.  
Assume suitable data/value, if not given.  
Notations have their usual meanings.

1a  
(i) What are the different possible sources of water for domestic water supplies?  
(ii) Enumerate the difference in quality of water of these sources.  
(iii) List important parameters that you may find in river water, their significance, and laboratory test procedure in brief.

1b  
A water treatment plant receiving water from a nearby river is to be proposed for domestic water supply. Suggest the scheme or units required to make this raw water as 'potable'. Prepare flow diagram of your scheme and discuss functioning of each proposed unit. Also modify your scheme if this source contains little amount of organic matter as well.

OR

1b'  
While direct potable reuse of reclaimed municipal wastewater is, at present, limited to extreme situations, it has been argued that there should be a single water quality standard for potable water. If reclaimed water can meet this standard, it should be acceptable regardless of the source of water. Discuss pros and cons of this argument focusing on health risks as well as ethics and public acceptance issues.

2a  
What are the effects of hard water in industrial and domestic application? How it is removed?

2b  
When coagulation & flocculation processes are required in water treatment? Discuss the mechanism of these two processes.

2c  
(i) Assume the flow is steady and continuous for a flash mixing chamber of flocculation tank having size 3.2m long and 1.75 m wide with water to a depth of 1.7 m. If the flow to the flash mix chamber is 7.2 litres/sec, what is the chamber detention time (in hours)?  
(ii) Calculate the pH values for two solutions (a) in which \([\text{OH}^-]\) are .001 mole/  
(b) in a solution \([\text{OH}^-]\) is \(2.7 \times 10^{-3}\) mole/  

3a  
What are the aerobic and anaerobic processes for wastewater treatment? List some common technologies on the basis of this categorization.

3b  
A UASB sewage treatment plant is to be set-up to treat 10 MLD flow. The incoming BOD is 250mg/l. By assuming suitable upflow velocity and other design conditions, calculate no. of UASB reactors required, volume and HRT of each reactor.
3b' Using the above input parameters, design a primary sedimentation tank, aeration tank and secondary clarifier. F/M ratio = 0.3 to 0.6. Assume MLSS = 3500 mg/l.

4a What are the different sources of air pollution? Discuss primary and secondary sources of air pollution?

4b List few air pollutants, associated diseases and their permissible levels in the atmosphere.

4c A thermal power plant having two coal-fired furnaces discharges into one stack, which is 205 m tall. Each furnace is fired with coal at the rate of 275 tons for every 24 hrs. The combustion air is supplied at the rate of 4.53 kg for each kg of coal. The gases exit from the stack with a velocity of 609 cm/sec. The atm. temperature is 60°F. The wind velocity is 10 miles/hr at 10m. Calculate plume rise in meters.

5a The density of Indian municipal solid waste (MSW) differs from Western MSW. Is this low or high compared to Indian waste? Explain the reason to justify this difference.

5b Write physical and chemical characteristics of MSW.

5c What are the different disposal techniques for MSW. Write each in brief.

6 Write brief notes on any four of the following:
   a) Gravity Settling Chamber
   b) Suspended and Attached Growth Culture System
   c) Lapse rate
   d) Purpose of Chlorine Contact Tank
   e) Biochemical Oxygen Demand
Maximum Marks: 60
Credits: 04
Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

1(a) Discuss in detail the responsibilities of the different layers in the OSI reference model. [08]

OR

1(a') Write a detailed note on Transmission media. How are they classified? [08]

1(b) Explain in detail the Ethernet protocol IEEE 802.3. What different types of connectors are available? [07]

2(a) Write a note on the following protocols HTTP, Telnet, FTP and SMTP. [08]

OR

2(a') Explain in detail the leaky bucket algorithm to improve QoS. [08]

2(b) What are the various IGP and EGP used? With the help of suitable network diagrams explain the RIP routing protocol. [07]

3(a) What do you understand by the Entity-Relationship model? Explain with the help of suitable examples and diagrams. [08]

OR

3(a') With the help of suitable example explain what are domains, entities, relation, keys, attributes, degree, tuples and cardinality [08]

3(b) What are the major DBMS functions and components? Explain. [07]

4(a) Explain in detail the 3NF. How is it different from BCNF? [08]

OR

4(a') What is a transaction? What are its properties? How transactions are recovered from a soft crash like power outage? [08]

4(b) What are the three concurrency problems? Illustrate how these problems are solved by locking? [07]