Code: 9A02701

B.TECH IV Year I Semester (R09) Regular Examinations, November 2012

DISTRIBUTION OF ELECTRIC POWER

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) A 50 MW hydro generator delivers 320 million KWh during the year. Calculate the plant load factor.

(b) Explain the load characteristics of distribution system.

2 (a) Distinguish between primary and secondary distribution systems with suitable examples.

(b) A 2-wire DC distributor AB, 600m long as loaded as under: Distance from (mts): 150 300 350 450 loads (Amps): 100 200 250 300. The feeding point A is maintained at 440V and that of B at 430V. If each conductor has a resistance of 0.01 per 100 m, calculate i. The currents supplied from A to B.
ii. The power dispatched in the distributor.

3 (a) Classify different types of primary feeders and give their merits and demerits.

(b) Derive the condition of load factor for which the voltage drop is maximum.

4 (a) What are the factors to be considered for selecting location of substations?

(b) Explain the single bus bar system with sectionalization and what are its merits and demerits.

5 (a) Explain the effect of shunt compensation on distribution system.

(b) A 3-phase substation transformer has a name plate rating of 7250KVA and a thermal capability of 120% of the name plate rating. If the connected load is 8816KVA with a 0.85pf lagging p.f., determine the following:

(i) The KVAR rating of the shunt capacitor bank required to decrease the KVA load of the transformer to its capability level.

(ii) The power factor of the corrected level.

6 Show that power loss due to load currents of the two phase, 3 wire lateral with full capacity neutral is exactly equal to 2.25 times larger than the one in which equivalent three phase lateral is used. Also prove that VD pu, 2ø =2.1xVDpu, 3ø for the above system.

7 (a) Why the improvement of power factor is very important for both consumers and generating stations? List the various causes of low power factor and explain.

(b) A single-phase motor takes a current of 10 amps at a p.f. of 0.707 lagging from a 230V, 50 Hz supply. What value must a shunting capacitor have to raise the p.f. to unity.

8 (a) Explain the salient points in general co-ordination procedure.

(b) Explain fuse-fuse coordination.

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Code: 9A02701

B.TECH IV Year I Semester (R09) Regular Examinations, November 2012

DISTRIBUTION OF ELECTRIC POWER

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 Discuss about different load modeling and their characteristics.

2 (a) Discuss briefly the requirements of a distribution system.

(b) A 2-wire DC ring distributor is 300 m long and is fed at 240 V at point A. At point B, 150 m from A, a load of 120 A is taken and at C, 100 m in the opposite direction, a load of 80 A is taken if the resistance per 100 m of single conductor is 0.03, find

i. Current in each section of distributor

ii. Voltage at points B and C.

3 (a) Explain radial type primary feeder with neat diagram.

(b) Assume that feeder has a length of 2 miles and that the new feeder uniform loading has increased to 3 times the old feeder loading. Determine the new maximum length of the feeder with the same percent voltage drop if the new feeder voltage level is increased 34.5 KV from the previous voltage level of 12.47 KV.

4 (a) Explain the main and transfer bus bar system with circuit diagram.

(b) What is the difference between single bus bar with and without sectionalization arrangement?

5 (a) Write short notes on any two methods of voltage control.

(b) Voltage control and p.f correction are necessary in power systems. Explain. What are the disadvantages of low voltage and low p.f of the system?

6 A single phase line (ABC) of length 2 Km having resistance and reactance (go and return) as 0.06 and 0.1 ohms/Km. A is the feeding point, B is the mid-point of the line taking a load of 100A at 0.9 p.f leads and C is the far end taking a load of 12 A at UPF. The voltage at the 'C' is 230V. Find the voltage at the sending end and the phase angle difference between the voltages of two ends. If

(a) Power factors of the loads are with reference to far end voltage.

(b) Power factors of the loads are with reference to the voltages at the load points.

7 (a) How is economical p.f arrived at for a given distribution system with different loads?

(b) A 440 V, 50 cycles three phase line delivers 250 KW at 0.7 p.f (lag). It is desire to bring the line p.f to unity by installing shunt capacitors. Calculate the capacitance if they are: i. star connected

ii. delta connected.

8 (a) What are the objectives of distribution system protection?

(b) What are the advantages and disadvantages of fuses?

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Code: 9A02701

B.TECH IV Year I Semester (R09) Regular Examinations, November 2012

DISTRIBUTION OF ELECTRIC POWER

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Give the classification of loads and draw their characteristics.
(b) A load of 100 kW is connected at the riverside substation. The 15 min weekly maximum demand is given by 75 kW and the weekly energy consumption is 4200 kWh. Find the demand factor, the 15 min weekly load factor of the substation and its associate loss factor.

2 (a) Write short notes on various systems of D.C distribution.
(b) Distinguish between a feeder, distributor and service main in a distribution scheme.

3 (a) Classify different types of primary feeders and give their merits and demerits.
(b) Explain basic design practice of secondary distribution system and also discuss about secondary banking.

4 What are the different types of bus-bar arrangements used in sub-station? Illustrate your answer with suitable diagrams?

5 (a) Define:
i. Voltage regulation ii. Voltage drop
iii. Nominal voltage iv. Rated voltage
v. Utilization voltage vi. Maximum voltage
vii. Minimum voltage
(b) Describe different types of equipment for voltage control with neat diagrams.

6 Derive the equation for voltage drop of square shaped service area of substation where the service area is provided with balanced load and lumped at different locations of laterals.

7 A 3-phase transformer rated 7000 KVA and has a over load capability of 125% of the rating. If the connected load is 11150KVA with a 0.8 pf(lag), determine the following:
(a) The KVAR rating of shunt capacitor bank required to decrease the KVA load of the transformer to its capability level.
(b) The p.f. of the corrected level.
(c) The KVAR rating of the shunt capacitor bank required to correct the load p.f to unity.

8 (a) Explain fuse-circuit breaker coordination.
(b) Explain recloser-circuit breaker coordination.

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Code: 9A02701

B.TECH IV Year I Semester (R09) Regular Examinations, November 2012

DISTRIBUTION OF ELECTRIC POWER

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Define coincidence factor and contribution factor.
(b) Obtain the relation between the load factor and loss factor.

2 (a) Discuss the relative merits and demerits of underground and over head systems.
(b) An 800m distributor fed from both ends A and B is loaded uniformly at the rate of 1.2 A/m run, the resistance of each conductor being 0.05 per/km. Determine the minimum voltage and the point where it occurs if feeding points A and B are maintained at 255 V and 250 V respectively. Find also the current supplied from feeding point A and B.

3 Derive the total area served by four feeders is 0.667 times the total area served by six feeders if they are thermally loaded.

4 (a) Explain the classification of substations according to design.
(b) What are the advantages and disadvantages of outdoor substation as compared to indoor substation?

5 (a) How is economical p.f arrived at for a given distribution system with different loads?
(b) Discuss the effect of series capacitors on voltage control.

6 (a) What are the different types of manual methods used for the solution of radial networks? Explain in detail.
(b) Derive the equation for load p.f for which the voltage drop is maximum.

7 (a) Explain the disadvantages of low power factor.
(b) A single-phase motor connected to a 240V, 50 Hz supply takes 20 A at p.f. of 0.75 lag. A capacitor is shunted across the motor terminals to improve the p.f to 0.9 lag. Determine the capacitance of the capacitor to be used.

8 (a) What is coordination? What is a protective device?
(b) Explain general coordination procedure.

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Code: 9A02702

B.TECH IV Year I Semester (R09) Regular Examinations, November 2012

FUNDAMENTAL OF HVDC & FACTS DEVICES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 Explain various types of HVDC links.

2 What is extinction angle control?

3 Why harmonics get generated in power systems? What are their harmful effects? How can they be removed from the systems?

4 How DC/AC converters are modelled for power flow studies? Describe simultaneous approach for load flow studies of AC/DC systems.

5 How do you justify the name “Flexible AC transmission systems” for certain equipment connected in a power system?

6 Describe control schemes of SSSC (static series synchronous compensator).

7 What are the objectives of shunt compensation? Describe midpoint compensation of a transmission line.

8 Describe the function of UPFC (unified power flow controller). How do you justify the name?

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Code: 9A02702

B.TECH IV Year I Semester (R09) Regular Examinations, November 2012

FUNDAMENTAL OF HVDC & FACTS DEVICES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 Analyse the bridge circuit of twelve pulse converter and arrive at the equivalent circuit.

2 (a) What are the various applications of high voltage DC transmission?
(b) Explain typical layout of HVDC converter station.

3 Explain the control of HVDC link with reference to power transmitted between two areas connected by the link.

4 Explain principles of static VAr compensators and their applications.

5 Describe briefly various types of FACTS controllers available.

6 What is meant by midpoint compensation with respect to shunt compensation? Explain the advantages to the power system by adapting to it.

7 Why is TCSC (thyristor controlled series capacitor) used in transmission line? Explain its advantages and disadvantages.

8 What is the basic principle of a UPFC (unified power flow controller)?

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Code: 9A02702

B.TECH IV Year I Semester (R09) Regular Examinations, November 2012

FUNDAMENTAL OF HVDC & FACTS DEVICES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 With a neat sketch explain typical layout of a HVDC converter station.

2 Explain the sequence of steps taken in starting and stopping of a DC link.

3 What are the various sources of reactive power in a power system? Explain the necessity of compensating reactive power. List out relative advantages and disadvantages of each source of reactive power.

4 Explain various approaches to the solution of AC-DC power flow.

5 Describe various types of FACTS controllers briefly and what improvements can they bring about in the performance of a power system.

6 Compare the performance and advantages of SVC and STATCOM.

7 What are the objectives of series compensation? Describe the functioning of static series synchronous compensator (SSSC).

8 Describe the working principle of a FACTS device capable of supply and control of independent real and reactive power.

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Code: 9A02702

B.TECH IV Year I Semester (R09) Regular Examinations, November 2012

FUNDAMENTAL OF HVDC & FACTS DEVICES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 Compare the HVDC transmission system with HVAC transmission system listing advantages and disadvantages of them.

2 What are the principles of DC link control?

3 How do harmonics arise in power systems? Describe various filters used for controlling harmonics.

4 How is DC load flow conducted?

5 Explain how FACTS devices help in controlling power flows.

6 Explain in detail principle of working of static VAr compensator (SVC).

7 Explain the improvement that a TCSC can bring about in a power system and what are its disadvantages.

8 Describe the basic operating principle of a UPFC (unified power flow controller).

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Code: 9A02703

B.TECH IV Year I Semester (R09) Regular Examinations, November 2012

SWITCH GEAR AND PROTECTION

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 Write short notes on the rate of restriking voltage and explain its importance in arc extinction.

2 (a) Explain the merits and demerits of SF_6 gas circuit breaker.
(b) Explain the operation of SF_6 circuit breaker with relevant sketch in a detailed manner.

3 (a) Explain about different types of distance relays.
(b) Compare their merits and demerits and give their field of applications.

4 (a) Explain the merits and demerits of static relays.
(b) Discuss how an amplitude comparator can be converted into a phase comparator and vice versa.

5 A 6.6 kV, 4000 kV A star connected alternator with a transient reactance of 2 Ω / phase and negligible resistance, is protected by a circulating current protective system. The alternator neutral is earthed through a resistor of 7.5Ω. The relays are set to operate when there is an out of balance current of 1 A in the secondary windings of the 500/5 current transformers. What percentage of each phase winding is protected against an earth fault?

6 (a) Discuss earth fault protection for transformers.
(b) A 3-phase transformer rated for 33kV/6.6kV is connected star-delta and the protecting current transformer on the low voltage side have a ratio of 400/5. Determine the ratio of the current transformer on the HV side.

7 (a) What is a protective relay? What are the fundamental requirements of protective relaying? What are the unit system of protection and non-unit system protection?
(b) Explain in detail the primary and back-up protection. What are the advantages of zonal protection?

8 Describe the construction and principle of operation of valve type and Zinc oxide lightning arrester.

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Code: 9A02703

B.TECH IV Year I Semester (R09) Regular Examinations, November 2012

SWITCH GEAR AND PROTECTION

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Explain the terms recovery voltage, restriking voltage and RRRV.
(b) Derive the expression for the restriking voltage in terms of system capacitance and inductance.

2 (a) Explain the merits of minimum oil circuit breaker over the bulk oil breakers.
(b) Explain the performance of a circuit breaker when capacitive currents are interrupted.

3 (a) Explain how to provide directional feature for impedance and reactance relays and also explain its necessity.
(b) Explain why attracted armature type relays are noisy. What measures are take to minimize the noise?

4 (a) Explain the operating principle of rectifier bridge phase comparator with necessary diagrams.
(b) Why block average phase comparator is preferred over block spike phase comparator?

5 (a) Explain how the inclusion of a resistance in the neutral earthing circuit of an alternator affects the performance of the differential protection of the three-phase stator.
(b) Describe how protection is provided in large turbo-alternators against earth-fault in the rotor.

6 (a) Write short notes on different transformer faults.
(b) Describe the construction, principle of operation and applications of Buchholz relay. Why this form of protection is an ideal protection scheme for transformers?

7 (a) What is voltage differential protection of bus bar and how is it superior to circulating current protection.
(b) Discuss the necessity of bus bar protection.

8 (a) What are various methods of over voltage protection of overhead transmission lines?
(b) Explain clearly how the rating of a lightning arrester is selected. What is the best location of a lightning arrester and why?

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Code: 9A02703

B.TECH IV Year I Semester (R09) Regular Examinations, November 2012

SWITCH GEAR AND PROTECTION

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain about current zero interruption and what are its advantages.
(b) In a system the r.m.s voltage is 19.1 kV, L is 10 mH, C is 0.02 μF. Determine the average rate of rise of restriking voltage, when the circuit breaker opens.

2 (a) Explain resistance switching in detail with relevant diagrams and derive the expression of damped oscillation.
(b) Describe the construction and principle of operation of SF_6 circuit breaker.

3 What is the effect of arc-resistance on the performance of impedance relay and explain how it is overcome in case of Mho relay?

4 Write notes on an amplitude / pulse width converter as applied in a phase sensitive amplitude comparator.

5 Write short notes on (i) static sine comparator (ii) integrating type (iii) amplitude comparator.

6 (a) Explain a scheme of protection for failure of alternator excitation.
(b) Explain with neat diagram the Merz-price protection for generator.

7 (a) Discuss about differential protection scheme for transformers.
(b) A 3-phase transformer rated for 33kV/6.6kV is connected star/delta and the protecting current transformer on the low voltage side have a ratio of 400/5. Determine the ratio of the current transformer on the HV side.

8 (a) Explain the phenomena of lightning and the traveling waves caused by its on transmission lines.
(b) What are the causes of over – voltages arising on a power system? Why is it necessary to protect the lines and other equipment of the power system against over– voltages?

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Code: 9A02703

B.TECH IV Year I Semester (R09) Regular Examinations, November 2012

SWITCH GEAR AND PROTECTION

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 Explain the following in detail:
(i) Symmetrical breaking capacity.
(ii) Asymmetrical breaking capacity.
(iii) Rating of circuit breakers.

2 (a) Explain the phenomena of current chopping and discuss its effects. Suggest various methods to overcome the same.
(b) Draw a neat sketch of minimum oil circuit breaker and explain its working.

3 Discuss the directional impedance relay and explain the directional impedance relay by means of its characteristic on R-X plane.

4 (a) Explain with necessary diagrams the operating principle a rectifier bridge phase comparator.
(b) Why block average phase comparator is preferred over block spike phase comparator.

5 (a) Describe the prime mover failure protection schemes of an alternator.
(b) The neutral point of a 3-ϕ, 20MVA, 11kV alternator is earthed through a resistance of 5 Ω, the relay is set to operate when there is an out of balance current of 1.5 A. The C.T.s has a ratio of 1000/5. What percentage of winding is protected against an earth fault and what should be the minimum value of earthing resistance to protect 90% of the winding?

6 (a) Draw and explain the connecting diagram of a star/delta power transformer using percentage differential relays.
(b) What is Translay protection? Give such a scheme of protection for 3-phase transmission line.

7 (a) With a neat sketch, explain the differential scheme for bus zone protection.
(b) Explain the working principle of frame leakage protection.

8 Write short notes of the following:
(i) Expulsion type lightning arrester.
(ii) Non-linear surge diverter.
(iii) Metal oxide surge arrester.

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Code: 9A02706

B.TECH IV Year I Semester (R09) Regular Examinations, November 2012

RENEWABLE ENERGY SOURCES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Explain the spectral irradiance of solar radiation.
(b) Explain the construction and working of angstrom compensation pysheliometer.

2 (a) Describe the functioning of a flat plate collector with a line diagram.
(b) What are the advantages of using selective surfaces for solar thermal collectors?

3 Explaining all necessary features, formulate the expression for calculating temperature distribution and collection efficiency of a solar pond.

4 (a) How do you classify wind mills? Explain about any one type with neat sketches?
(b) Derive the expression for power developed due to wind.

5 (a) What are the factors affecting bio digestion?
(b) What are the design considerations for biodigester?

6 (a) Explain the advantages and disadvantages of geothermal energy over the other forms of energy.
(b) What are the applications of geotechnical energy in the field of agriculture?

7 (a) What is a tidal cycle? Define spring and neap tides. Discuss the reasons for tide formation.
(b) Explain single basin arrangement for tidal generation.

8 List the various direct energy conversion devices. With a neat sketch, explain the working of thermo-electric generator.

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Code: 9A02706

B.TECH IV Year I Semester (R09) Regular Examinations, November 2012

RENEWABLE ENERGY SOURCES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Differentiate between beam radiation and diffused radiation.
(b) With the aid of a sketch, explain the working of a pyrhetiometer.

2 Explain how the efficiency of a flat plate collector is evaluated also give the advantages of flat plate collectors.

3 (a) What are the various methods of storing solar energy?
(b) Discuss in detail any two of the solar energy storage methods.

4 (a) Describe with a neat sketch the components of a horizontal axis type aero generator.
(b) Calculate the maximum power available in kW for the windmill of rotor radius 8 m and experiencing a wind velocity of 10 m/s at standard atmospheric pressure and temperature of 25°C. Also calculate: (i) Maximum torque (ii) Axial thrust, if the rotor speed in 30 rpm.

5 (a) How are biofuels classified?
(b) Explain, with the aid of a sketch, the anaerobic digestion system for biogas.

6 (a) Explain briefly the possible sources of geothermal pollution? How these are avoided?
(b) Give a brief note on prospects of geothermal energy in context to India.

7 (a) What is the basic principle of OTEC? Discuss the advantages of the closed cycle system over open cycle system.
(b) The efficiency of power plant working on OTEC system is very less. However, the secondary advantages make it commercially attractive. Discuss.

8 What is the basic principle of direct energy conversion systems? Describe briefly the working of a thermoelectric generator. Explain Seebeck, Peltier, Joule and Thomson effects.

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Code: 9A02706

B.TECH IV Year I Semester (R09) Regular Examinations, November 2012

RENEWABLE ENERGY SOURCES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) What is extra terrestrial radiation?
(b) Determine the L.S.T. and declination at Bhopal (latitude 230 15'N, longitude 770 30'E) at 12:30 IST on June 19.

2 Calculate the angle made by beam radiation with the normal to a flat collector on December 1 at 9.00 AM, solar time for a location at $28^0$35'N. The collection is tilted at an angle of latitude plus10^0, with the horizontal and is pointing due south.

3 (a) What is a solar pond? Explain it with a suitable sketch.
(b) How is energy stored in solar pond? Explain its mechanism with a neat diagram.

4 (a) Explain the architecture of a wind energy conversion system with a neat block diagram.
(b) Describe the horizontal & vertical axis wind turbine configurations with neat sketches.

5 (a) How are the biogas plants classified?
(b) Explain the constructional details and working of KVIC digester with the help of a neat diagram.

6 (a) Describe a binary cycle system for liquid dominated system.
(b) What are the main applications of geothermal energy?

7 (a) Explain with neat sketches the basic principle of tidal power generation. What are the limitations of each method?
(b) A tidal project has installed capacity of 2176 MW in 64 units each of 34 MW rated output. The head at rated output is 5.52 m. The embankment is 6.4 m long. Assume 93% efficiency for both turbine and generators. The generation is 5 hours twice a day. Calculate:
(i) The quality of water flowing through each turbine.
(ii) The surface area of reservoir behind the embankment.

8 (a) Why is Carnot cycle not applicable in the estimation of efficiency of thermo-electric generator?
(b) Explain the principle of working of thermo-electric generator.

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Code: 9A02706

B.TECH IV Year I Semester (R09) Regular Examinations, November 2012

RENEWABLE ENERGY SOURCES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 Explain the following:
(i) Beam and diffuse solar radiation.
(ii) The hour angle.
(iii) The sun's declination.
(iv) The latitude and longitude.

2 Explain the advantages and disadvantages of concentrating collectors over flat plate type collectors.

3 Explain the principle, construction and working of non convective solar pond.

4 Explain with neat sketch working of a vertical axis windmill. Explain different components.

5 (a) How is biogas plants classified? Explain the batch type and floating drum type of biodigesters with sketch.
(b) What are the advantages and disadvantages of floating drum plant?

6 (a) Estimate the energy potential in hot dry rock geothermal resource. What are the difficulties in extraction for power production?
(b) Describe with the help of a sketch the method of converting the vapor dominated geothermal system into power.

7 (a) Explain the working of ocean thermal energy conversion (OTEC) plant.
(b) Discuss the various equipment for the establishment of an off shore OTEC system.

8 Discuss the direct and indirect energy conversion systems emphasizing on the advantages and limitations of each.

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B.Tech IV Year I Semester (R09) Regular Examinations November 2012

OPTIMIZATION TECHNIQUES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

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1. Show that function $f(x) = x_2; 0 \le x \le 1,\ f(x) = 2 - x, 0 \le x \le 1$, is unimodel in (0,2). Use the Fibonacci method to find its maximal point within an interval of uncertainty 0.1.

2. Find the optimum solution of the following constrained multivariable problem:
$\text{Maximum } Z = 9 - x_1 - 6x_2 - 4x_3 + 2x_1^2 + 2x_2^2 + x_3^2 + 2x_1x_2 + 2x_1x_3$
$\text{subject to } x_1 + x_2 + 2x_3 = 3.$

3. Solve the following problem by dynamic programming:
$$\text{Max } Z = y_1^2 + y_2^2 + y_3^2$$
$\text{subject to constraint } y_1.y_2.y_3 \le 4 \ \&\ y_1, y_2, y_3 \ge 0$ and integers.

4. Food X contains 6 units of vitamin A per gram and 7 units of vitamin B per gram and cost is 12 paise/gm. Find Y contains 8 units of vitamin A per gram and 12 units of vitamin B per gram and cost is 20 paise/gm. The daily minimum requirement of vitamin A & B are 100 and 120 units respectively. Use graphical method to find the cost of product min.

5. (a) Determine the maximum and minimum values of the function: $12x^5 - 45x^4 + 40x^3 + 5.$
   (b) A d.c generator has internal resistance of R ohms and develops an open circuit voltage of 'V' volts. Find the value of load resistance 'r' for which the power developed by generator will be maximum.

6. Explain the difference between the interior and extended interior penalty function methods.

7. (a) Compare transportation problem with simplex method.
   (b) Solve the following transportation problem

					Auxilatity
	9	16	15	9	15
	2	1	3	5	25
	6	4	7	3	20
Requirement	10	15	25	10	

8. What elementary operation can be used to transform
$$2x_1 + x_2 + x_3 = 9$$
$$x_1 + x_2 + x_3 = 6$$
$$2x_1 + 3x_2 + x_3 = 13$$
$$\text{into } x_1 = 3$$
$$x_2 = 2$$
$$x_1 + 3x_2 + x_3 = 13$$
Find the solution of this system by reducing into canonical form.

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Code: 9A02709

2

B.Tech IV Year I Semester (R09) Regular Examinations November 2012

OPTIMIZATION TECHNIQUES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

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1. (a) Determine the maximum and minimum values of the function $12x^5 - 45x^4 + 40x^3 + 5$.
   (b) A d.c generator has internal resistance of R ohms and develops an open circuit voltage of 'V' volts. Find the value of load resistance 'r' for which the power developed by generator will be maximum.

2. (a) State and explain the necessary and sufficient conditions for existence of relative optima in case of multivariable optimization with constraints.
   (b) Find the dimensions of a rectangular parallelepiped with largest volume whose sides are parallel to the coordinate planes to be inscribed in the ellipsoid.

3. A TV manufacturing company has 3 major departments for its manufacture of two methods A and B monthly capacities are given

	Per unit (hours) Time requirement		Total machines hrs available in a month
	A	B	
Department 1	4	2	1600
Department 2	2.5	1	1200
Department 3	4.5	1.5	1600

The marginal profit of A is Rs 400/- each and that of model B is Rs 100/- Assuming that the company sells any quantity of either product due to favorable market conditions; determine the optimum output for both models for higher possible profit for a month. Use graphical method.

4. (a) When do you get degeneracy in transportatun problem?
   (b) Solve the following transportation problem

				Auxilatity
	7	4	0	5
	6	8	0	15
	3	9	0	9
Requirement	15	6	8	

5. Use simplex method to

$$\text{Maximize } Z = 3x_1 + 2x_2 + 3x_3$$
$$\text{subject to } 2x_1 + x_2 + x_3 \leq 2$$
$$3x_1 + 4x_2 + 2x_3 \geq 8$$
$$x_1, x_2 \geq 0.$$

6. $\text{Minimize } f = 4x_1^2 + 3x_2^2 - 5x_1x_2 - 8x_1$ Staring from the (o,o) using Powell's method.

7. Explain an interior penalty function to solve a constrained non linear programming.

8. A truck can carry a total of 10 tonnes of product three types of products are available for shipment. Their weights & values are tabulated. Assuming that at least one each type must be shipped; determine the loading which will maximize the total value

Product type	Value (Rs)	Weight tonnes)
A	20	1
B	50	2
C	60	3

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Code: 9A02709 3

B.Tech IV Year I Semester (R09) Regular Examinations November 2012

OPTIMIZATION TECHNIQUES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

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1. (a) Define the following:
(i) Feasible solution. (ii) Basic feasible solution. (iii) R_{im} requirements. (iv) Independent position of allocation.
(b) For mxn transportation tableau, show that the North-West corner rules evaluates n+m-1 of variables.

2. Explain the following unconstrained optimization methods in details.
(a) Steepest descent method.
(b) Powell's method.

3. (a) By using an interior penalty method solve the following problem

$$g(x) = -(-x_1 - 1)^2 + (x_2 - 5)^2$$
$$\text{subject to} -x_1^2 + x_2^2 - 4 \leq 0$$
$$-(x_1 - 2)^2 + x_2 - 3 \leq 0.$$

(b) State and explain the generalized representation of exterior penalty function method.

4. Use dynamic programming to show that $-\sum_{i=1}^{n} p_i \log p_i$ subjected to $\sum_{i=1}^{n} = 1$, is maximum, when $P_1 = P_2 = P_3 \ldots\ldots\ldots\ldots P_n = {}^{1}/_{n}$

5. (a) Draw the flow chart for implementing Fibonacci search method. State the problem conducing last experiment in this method.
(b) What are the limitations of classical methods in solving a one-dimensional minimization problem.

6. (a) With suitable examples difference a constraint surface and a composite constraint surface.
(b) Enumerate few engineering applications of optimization.
(c) Explain how to solve a maximization problem as a minimization problem with suitable examples.

7. Find all the local maxima and minima and all the global maxima and minima, if any of the following functions. For any extreme point that you find, give both maximizer or minimizer (value of x) and maximum or minimum (value of $f(x)$).
(a) $f(x) = x^3 - 3 \text{ on } [-1,1]$ (b) $f(x) = x^3 + 3x + 5 \text{ on } [-3,3]$.

8. (a) Draw flow chart for finding optimal solution by simplex method.
(b) For the following LPP model, introduce slack, surplus and artificial variables to form an equivalent problem that can be presented to simplex method to obtain an optimal solution.

$$\text{maximize } Z = 3x_1 + 2x_2 + 8x_3.$$
$$\text{subjected to } 4x_1 - 3x_2 + 12x_3 \geq 12$$
$$x_1 + 4x_3 \leq 6$$
$$x_1 - x_3 = 2 \text{ and } x_1 \geq 0.$$

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Code: 9A02709 4

B.Tech IV Year I Semester (R09) Regular Examinations November 2012

OPTIMIZATION TECHNIQUES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

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1. (a) Explain a single variable optimization technique.
   (b) Find the maxima and minima of

$$f(x) = \frac{x^4}{(x-1)(x-3)^3}$$

2. Find the optimum solution of the following constrained multivariable problem:
   $\text{Maximum } Z = 9 - x_1 - 6x_2 - 4x_3 + 2x_1^2 + 2x_2^2 + x_3^2 + 2x_1x_2 + 2x_1x_3$
   subject to $x_1 + x_2 - 2x_3 = 3$.

3. Use the method of steepest descent to go two steps towards the maximum of $f(x) = -2x_1^2 - x_2^2 - x_3^2 - 4x_4^2$ starting at point (-,, 1,0,-1).

4. Solve the following problem by dynamic programming:

$$\text{Max } Z = y_1^2 + y_2^2 + y_3^2$$

   subject to constraint $y_1.y_2.y_3 \leq 4$ & $y_1, y_2, y_3 \geq 0$ and integers.

5. Classify the constrained optimization techniques and briefly explain each technique.

6. (a) State and explain the standard form of LPP.
   (b) Explain the significance of slack, surplus and artificial variables of LPP.

7. Solve the following transportation problem

Sources	Destinations			Amount
	1	2	3	Availability
A_1	C_{11}	C_{12}	C_{13}	a_1
A_2	C_{21}	C_{22}	C_{23}	a_2
Amount required	b_1	b_2	b_3	G

   where
   (a) $G=\sum a_i - \sum b_j$
   (b) C_{ij} = Unit cost transportation form i^{th} source to j^{th} destination.

8. Write down the step wise procedure for implementing quadratic interpolation method.

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Code: 9A04603

1

IV B. Tech I Semester (R09) Regular Examinations, November 2012

DIGITAL SIGNAL PROCESSING

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Discuss the applications of digital signal processing.
(b) Sketch following signal and find its energy or power whichever is appropriate x(n) = u(n) - u(n-5).

2 (a) Distinguish between DTFT and DFT.
(b) State and prove following properties of DFS:
(i) Shift of a sequence.
(ii) Duality.

3 Discuss in detail the concept of decimation in frequency FFT. Also sketch the necessary flow graph for N=8.

4 Find inverse z-transform of following z-transforms using partial fraction expansion:
(i) $X(z) = 1/(1 - 1.5z^{-1} + 0.5z^{-2})$.
(ii) $X(z) = 1/(1+z^{-1})(1-z^{-1})^2$.

5 Discuss the approximation of IIR filter design using derivatives.

6 Consider the following specifications for a band pass filter:

$|H_d(e^{j\omega})| \le 0.01 \qquad 0 \le |\omega| \le 0.2\pi$

$0.92 \le |H_d(e^{j\omega})| \le 1.02 \qquad 0.3\pi \le |\omega| \le 0.7\pi$

$|H_d(e^{j\omega})| \le 0.02 \qquad 0.8\pi \le |\omega| \le \pi$

Design a linear phase FIR filter to meet these specifications using Bartlett window.

7 Explain the concepts of decimation and interpolation with the help of waveform illustrations.

8 With the help of block diagram explain about natural sounding reverberator scheme.

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Code: 9A04603

2

IV B. Tech I Semester (R09) Regular Examinations, November 2012

DIGITAL SIGNAL PROCESSING

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 Describe all the characteristics of systems in detail.

2 (a) Explain how DFT is obtained from DTFT.
(b) State and prove following properties of DFS:
(i) Linearity. (ii) Periodic convolution.

3 (a) What are the twiddle factors? Explain.
(b) Find DFT of sequence using DIT-FFT: x (n) = {1/2, 1/2, 1/2, 1/2, 0, 0, 0, 0}.

4 State and prove following properties of z-transform:
(i) Time reversal.
(ii) Time convolution.
(iii) Differentiation in z-domain.

5 (a) Discuss the mapping s – domain to z – domain using backward difference method.
(b) Convert following analog filter transfer function into digital filter transfer function using backward difference method $H(s) = 1/(s^2 + 0.9)$.

6 (a) Discuss about characteristics linear phase FIR filters.
(b) What are the effects of windowing?

7 Implement a two stage decimator for the following specifications. Sampling rate of the input signal = 21,000 Hz:
M=100
Pass band = 0 to 40 Hz
Transition band = 40 to 50 Hz
Pass band ripple = 0.01
Stop band ripple = 0.002

8 Discuss about following time domain operations pertaining to musical sound processing:
(i) Flanging.
(ii) Chorus generation.
(iii) Phasing.

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Code: 9A04603

3

IV B. Tech I Semester (R09) Regular Examinations, November 2012

DIGITAL SIGNAL PROCESSING

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 Find the impulse response of the causal system:
$y(n) - 3y(n-1) + 2y(n-2) = x(n) + 3x(n-1) + 2x(n-2)$.

2 (a) Show that DFS of periodic sequence $x_p(n)$ is periodic with same period.
(b) State and prove duality property of DFS.

3 (a) Discuss how N-point DFT can be decomposed into two N/2 point DFT's in DIF-FFT. Assume radix-2 decimation.
(b) Find the 4-point DFT of the sequence, $x(n) = \cos(n\pi/4)$ using DIT – FFT algorithm.

4 (a) State and prove time shifting property of z-transform.
(b) Determine z-transform, ROC and pole-zero locations of
$x(n) = \alpha^n u(n) + \beta^n u(-n-1)$

5 Describe Butterworth approximation of obtaining IIR filter transfer function for given frequency response.

6 (a) Explain characterization of FIR filters.
(b) Sketch and explain the frequency response of non ideal digital high pass filter.

7 Implement a two stage decimator for the following specifications. Sampling rate of the input signal = 15,000 Hz:
M=50
Pass band = 0 to 40 Hz
Transition band = 40 to 50 Hz
Pass band ripple = 0.01
Stop band ripple = 0.002.

8 (a) Explain about digital music synthesis.
(b) Discuss about spectral analysis of sinusoidal signals.

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Code: 9A04603

4

IV B. Tech I Semester (R09) Regular Examinations, November 2012

DIGITAL SIGNAL PROCESSING

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 State and prove following properties DTFT:
(i) Periodicity.
(ii) Time reversal.
(iii) Convolution.

2 Discuss all types of symmetric properties of DFT.

3 Explain radix 2 DIT-FFT algorithm in detail. Explain how calculations are reduced.

4 Realize system with following difference equation in direct form-I, direct form-II, cascade and parallel:
$y(n) = (3/4)\, y(n-1) – (1/8)\, y(n-2) + x(n) + (1/3)x(n-1)$.

5 (a) Explain the features type – I and II Chebyshev filters.
(b) What are the merits and demerits of Bilinear Transformation Method?

6 (a) What are the advantages and disadvantages of digital filters over analog filters?
(b) Sketch and explain the frequency response of non ideal digital low pass filter.

7 Implement a two stage decimator for the following specifications. Sampling rate of the input signal = 21,000 Hz:
M=100
Pass band = 0 to 50 Hz
Transition band = 50 to 70 Hz
Pass band ripple = 0.01
Stop band ripple = 0.002

8 With the help of block diagram, explain about signal compression system.

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