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Code No: RT21023 **R13** SET - 1

II B. Tech I Semester Regular Examinations, Jan - 2015
BASIC ELECTRONICS AND DEVICES
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Define Mobility
   b) Explain the operation of Light Emitting Diode.
   c) Define Load and Line Regulation.
   d) What is expression for ripple factor when capacitor filter is used with half wave rectifier?
   e) List out the advantages of negative feedback.
   f) Show that $\mu = g_m \, r_d$ in a Field Effect Transistor.
   g) Why RC oscillators are not used at High Frequencies.
   h) Define Q-Point.
   i) Draw the simplified h-parameter model of a Bipolar Junction Transistor.
   (2M+3M+2M+2M+3M+3M+2M+2M+3M)

PART-B

2. a) A sample of germanium has a n type impurity concentration of $3x10^{14}$ donors/cm^3 and p type impurity concentration of $4x10^{14}$ acceptors/cm^3. Find the values of n and p at room temperature.
   d) What is diffusion and drift phenomenon? Derive Einstein's relationship.
   c) In a Germanium semiconductor with step grading $N_D=2000N_A$ with N_A corresponding to 1 part in 10^8. Find the value of contact potential. (6M+5M+5M)

3. a) Derive an expression for Transition Capacitance of a diode.
   b) Explain the operation of tunnel diode. (8M+8M)

4. a) Derive the expressions for PIV, Conversion Efficiency and TUF of a Bridge rectifier.
   b) Explain the operation of series and shunt voltage regulators and also mention their performance factors. (8M+8M)

5. a) Explain the necessity of biasing a Transistor. Derive the Q-point of a self-bias circuit.
   b) Explain the stabilization of Q-point using sensistor and thermistor. (8M+8M)

6. a) Explain the construction and operation of depletion and enhancement mode MOSFET.
   b) Draw and discuss the VI characteristics of a silicon controlled rectifier. (8M+8M)

7. a) Derive an expression for frequency of oscillation of a RC Phase shift oscillator.
   b) Quantitatively explain the effect of negative feedback on input and output resistances.
   (8M+8M)
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Code No: RT21023 **R13** SET - 2

II B. Tech I Semester Regular Examinations, Jan - 2015
BASIC ELECTRONICS AND DEVICES
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) What is doping? Explain the necessity.
   b) Differentiate between Avalanche and Zener breakdowns.
   c) Explain the operation of series regulator.
   d) Derive the PIV of a bridge rectifier.
   e) What is the need for biasing? Explain.
   f) Compare BJT and FET.
   g) Draw the h parameter model of a common collector amplifier.
   h) Compare CE, CB and CC amplifiers.
   i) What is Barkhausen Criterion? (2M+2M+2M+2M+3M+3M+2M+3M+3M)

PART-B

2. a) A sample of germanium has been added with 10^{14} donors/cm^3 and $7x10^{13}$ acceptors/cm^3. Find the values of n and p at room temperature if the resistivity is 60 Ω-cm.
   b) What is electron gas theory description of metals?. Derive an expression for current density in metals and also derive an expression for current density in semiconductors. (8M+8M)

3. a) Explain VI characteristics of a Zener diode.
   b) Calculate the factor by which the reverse saturation current in Ge diode is multiplied when the temperature is increased from 25 to 70 degrees centigrade.
   c) Explain the operation of photodiode. (6M+5M+5M)

4. a) Derive the expressions for PIV, Ripple factor , Conversion Efficiency and TUF of a Full wave rectifier.
   b) A sinusoidal voltage of amplitude 20V, 50Hz is applied to a half wave rectifier. If R_L=1000Ω, R_f=10Ω, R_r=∞, Find the values of i) Conversion Efficiency ii)Ripple factor iii) Percent Regulation (8M+8M)

5. a) Explain the input and output characteristics of a Common Emitter Configuration.
   b) Draw the exact h parameter model of a Transistor suitable for any configuration. Derive expressions for voltage gain, current gain, input impedance and output impedance of an amplifier using exact h parameter model (8M+8M)

6. a) Derive an expression for voltage gain of a Common Drain Amplifier.
   b) Explain qualitatively the operation of field effect transistor. (8M+8M)

7. a) Derive an expression for frequency of oscillation and condition for sustained oscillations of a Wien Bridge oscillator.
   b) Enumerate the steps in the linear analysis of negative feedback amplifiers (8M+8M)

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Code No: RT21023 **R13** SET - 3

II B. Tech I Semester Regular Examinations, Jan - 2015
BASIC ELECTRONICS AND DEVICES
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Explain different topologies in negative feedback amplifiers?
   b) Define cut-in voltage of a diode.
   c) Define ripple factor, rectification efficiency of a rectifier.
   d) What is the purpose of using a filter in a power supply unit?
   e) What are the various modes of operation of an SCR?
   f) State the advantages of push-pull amplifiers.
   g) Draw the low frequency model of a FET.
   h) Show that gain reduces with negative feedback.
   i) Differentiate between an oscillator and an amplifier.
   (3M+2M+3M+2M+3M+2M+2M+3M+2M)

PART-B

2. a) What is Hall effect?. Derive an expression for hall coefficient.
   b) Find the resistivity of intrinsic silicon and Germanium at room temperature. (8M+8M)

3. a) Explain the operation of i) PIN diode ii) Varactor diode
   b) Explain the VI characteristics of pn junction diode. Discuss about the effect of temperature on diode characteristics. (8M+8M)

4. a) Derive the expressions for ripple factor of a full wave rectifier using capacitor filter.
   b) Explain how Zener diode acts as a regulator. (8M+8M)

5. a) What are the various current gains in a Transistor and derive the relationship between them.
   b) Derive simplified h parameter model of a transistor. State it's advantages. Derive an expression for voltage gain of CE, CB and CC amplifiers using simplified h parameter model.
   c) Derive the necessary condition to avoid thermal runaway in a transistor. (6M+5M+5M)

6. a) Explain the two transistor analogy of an SCR.
   b) Explain about specifications of a Thyristor.
   c) Perform DC and AC analysis of a common source amplifier. (6M+5M+5M)

7. a) Quantitatively explain the effect of negative feedback on Band width and sensitivity.
   b) Explain the operation of push-pull power amplifier. (8M+8M)
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II B. Tech I Semester Regular Examinations, Jan - 2015
BASIC ELECTRONICS AND DEVICES
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Draw the energy band diagram of an Insulator, Semiconductor and a metal.
   b) What is depletion region?
   c) Define peak inverse voltage of a rectifier.
   d) State the advantages of a bridge rectifier.
   e) What are various regions of operation of a BJT?
   f) Explain early effect.
   g) What is thermal run away?
   h) Draw the electrical equivalent of a crystal.
   i) What is pinch off voltage? (3M+2M+2M+3M+2M+3M+3M+2M+2M)

PART-B

2. a) What is Energy band theory description of a elements. Draw the energy band diagrams of metal, insulator and a semiconductor.
   b) Derive an expression for continuity equation.
   c) Find the concentration of electrons and holes in a p type Ge semiconductor at 300K if the resistivity is 60 $(\Omega\text{-cm})^{-1}$ (6M+5M+5M)

3. a) Explain the operation of Tunnel diode
   b) Explain various current components in a diode. (8M+8M)

4. a) What are the various filter circuits used in rectifiers. Compare their performance.
   b) Quantitatively explain the operation of half wave rectifier. (8M+8M)

5. a) Explain how transistor acts as a switch.
   b) Analyze CE with R_e circuit using h-parameter model. (8M+8M)

6. a) Explain the operation of a Field effect Transistor. Derive an expression for pinch-off voltage of a FET.
   b) Explain the operation of IGBT. (8M+8M)

7. a) Draw the different topologies in a negative feedback amplifier. Enumerate the steps in the analysis of negative feedback amplifiers.
   b) What is an oscillator? Derive necessary condition for the oscillator to produce oscillations. Explain about amplitude and frequency stability of oscillators. (8M+8M)
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Code No: RT21024 **R13** SET - 1

II B. Tech I Semester Regular Examinations, Jan - 2015
COMPLEX VARIABLES AND STATISTICAL METHODS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Write Cauchy Riemann equations in polar form.

   b) Find 'a' and ' b' if f(z) = $\left(x^2 - 2xy + ay^2\right) + i(bx^2 - y^2 + 2xy)$ is analytic.

   c) Write the test statistic for the differences of means of two large samples.

   d) Expand $f(z) = \dfrac{e^{2z}}{(z-1)^3}$ about z =1.

   e) Determine the poles of tanz and find the residue at the simple poles

   f) Find the bilinear transformation whose fixed points are 1 and 1

   g) Three masses are measured as 62.34,20.84,35.97 kgs with standard deviation 0.54,0.21,0.46 kgs. Find the mean and standard deviation of the sum of the masses.

   h) A sample size 10 was taken from population. Standard deviation of sample is 0.3. Find the maximum error with 99% confidence (2M+3M+2M+3M+3M+3M+3M+3M)

PART-B

2. a) Find the Analytic function whose real part is $u(x, y) = \dfrac{\sin 2x}{\cosh 2y + \cos 2x}$.

   b) Show that the function f(z) = $z\bar{z}$ is differentiable but not analytic at origin.

3. a) Evaluate $\int_c \dfrac{ze^{2z}}{(z-\pi i)^3} dz$, where c is a circle of radius 4 with centre at origin, by Cauchy integral formula

   b) Obtain Laurent's expansion for $f(z) = \dfrac{1}{(z+2)^2(z+1)}$ in $|z| > 2$
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4. a) Evaluate $\int_0^{2\pi} \frac{d\theta}{5+4\cos\theta}$

   b) Evaluate $\int_0^{\infty} \frac{\cos axdx}{(x^2+a^2)^2}$

5. a) Discuss the transformation w = cosz.

   b) Find the Bilinear transformation which maps z = -1, 0 ,1 onto w = 0, *i,3i*.

6. a) A random sample of size 64 is a taken from normal population with mean 51.4 and S.D 6.8. What is the probability that the mean of samples will (i) exceed 52.9 (ii) less than 50.6 (iii) between 50.5 and 52.3.

   b) Find the 95% confidence limits for mean of the population from which sample was taken from 15,17,10,18,16,9,7,11,13,14.

7. a) A college management claims that 75% of all single women appointed for teaching job get married and quit the job in two years. Test this hypothesis at 5% level of significance if among 300 such teachers, 212 got married within 2 years and quit then jobs

   b) In a test given two groups of students, the marks obtained are as follows

First Group	18	20	36	50	49	36	34	49	41
Second group	29	28	26	35	30	44	46	--	--

   Examine the significant difference between the means of the marks of the two group at 5% level.

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II B. Tech I Semester Regular Examinations, Jan - 2015
COMPLEX VARIABLES AND STATISTICAL METHODS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Define harmonic function and give an example

   b) If c is a simple closed curve then evaluate $\int_c (\sin 3z + z^4 + e^z)dz$

   c) Write test statistic for the differences of means of two small samples

   d) Find the residue of $f(z) = \frac{e^{2z}}{(z-1)^3}$ at z =1

   e) Determine the poles *of* *tanz* and find the residue at simple pole

   f) Find the bilinear transformation whose fixed points are i and -i

   g) Define two types of Errors in sampling.

   h) A sample size 10 was taken from population with S.D of sample is 0.3. Find the maximum error with 99% confidence (2M+3M+2M+3M+3M+3M+3M+3M)

PART-B

2. a) Find the Analytic function whose imaginary part is $v(x, y) = \frac{2\sin x \sin y}{\cosh 2y + \cos 2x}$

   b) Show that the unction f(z) = $\sqrt{|xy|}$ is not analytic at origin although CR equations are satisfied at the point

3. a) Evaluate $\int_c \frac{ze^{2z}}{(z-2)^3}dz$ where c is the circle with radius 3 by Cauchy integral formula

   b) Obtain Laurent's expansion for $f(z) = \frac{1}{(z+2)(z+1)}$ in $1 < |z| < 2$
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4. a) Evaluate $\int_0^{2\pi} \frac{d\theta}{5-4\sin\theta}$

   b) Evaluate $\int_0^{\infty} \frac{dx}{(x^6+1)}$

5. a) Discuss the transformation w = sinz

   b) Find the Bilinear transformation which maps z = ∞, *i, 0* onto w = -1,-*i,* 1

6. a) Show that Sample mean is the unbiased estimator of population mean

   b) A random sample of size 100 taken from normal population with mean 76 and S.D 16. What is the probability that the mean of samples will (i) exceed 78 (ii) less than 60 (iii) between 75 and 78.

7. a) The mean production of rice in a sample of 100 fields is 200 lb per acre with S.D of 10 lb. Another sample of 150 fields gives the mean 220 lb and S.D 11 lb. Find if the two results are consistent at 1% level.

   b) The nine items of the sample had the following values: 45,47,50,52,48,47,49,53, and 51. Does the mean of nine items differ significantly from the population mean of 45.57 at 1% level.

Code No: RT21024 **R13** SET - 3

II B. Tech I Semester Regular Examinations, Jan - 2015
COMPLEX VARIABLES AND STATISTICAL METHODS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Find the invariant points of $w = \frac{1+z}{1-z}$.

   b) Find the Harmonic conjugate of $\log\sqrt{x^2+y^2}$.

   c) Evaluate $\int_c \frac{dz}{z-3}, where\ c: |z-2| = 5$.

   d) Find the residue of $f(z) = \frac{e^{2z}}{(z-2)^2}$ at z =2.

   e) Determine and classify the singular point of f(z) = $z^2 \sin\left(\frac{1}{z}\right)$.

   f) Write any three characteristics of Normal Distribution.

   g) Define Hypothesis, Critical region and Standard error.

   h) If we can assert 95% that maximum error is 0.05 and p =0.2 find the sample size.

(2M+3M+2M+3M+3M+3M+3M+3M)

PART-B

2. a) Find the Analytic function given that $v + u = \frac{\sin 2x}{\cosh 2y - \cos 2x}$.

   b) Show that the unction f(z) = $\frac{x^3 y(y-ix)}{x^6+y^2}$ is not analytic at origin although CR equations are satisfied at the point.
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3. a) Evaluate $\int_c \frac{e^z}{(z^2+1)} dz$ where c is the unit circle by Cauchy integral formula

   b) Obtain Laurent's expansion for $f(z) = \frac{1}{(z+2)(z+1)^2}$ in $|z| < 1$

4. a) Evaluate $\int_0^{2\pi} \frac{d\theta}{3-2\sin\theta}$.

   b) Evaluate $\int_0^{\infty} \frac{dx}{(x^4+1)}$.

5. a) Discuss the transformation $w = z^2$.

   b) Find the Bilinear transformation which maps $z = \infty, i, 0$ on to $w = 0, i, \infty$.

6. a) Show that Sample variance is not the unbiased estimator of population variance

   b) A random sample of size 36 is taken from normal population with mean 155 and S.D 15. What is the probability that the mean of samples will (i) exceed 157 (ii) less than 160 (iii) between 155 and 158.

7. a) A sample of 450 items is taken from a population with mean 30 and S.D 20. Test whether the sample has come from the population with mean 29. Also calculate 95% confidence limits of the population mean.

   b) Two samples are drawn from two normal populations from the following data, test whether the two samples have the same variance at 5% level.

Sample I	60	65	71	74	76	82	85	87	--	--
Sample II	61	66	67	85	78	63	85	86	88	91

Code No: RT21024 **R13** SET - 4

II B. Tech I Semester Regular Examinations, Jan - 2015
COMPLEX VARIABLES AND STATISTICAL METHODS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**
4. Probability tables Normal, t, F and chi square tables are required

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PART-A

1. a) Find the invariant points of $w = \frac{1}{z-2i}$.

   b) Find the Harmonic conjugate of $x^2 - y^2 + xy$.

   c) Evaluate $\int_c \frac{3dz}{z+1}, where\ c : |z| = 2$.

   d) Evaluate $\int_c ze^{\frac{1}{z}} dz$ where c is the unit circle by residue theorem.

   e) Determine and classify the singular point of $f(z) = \sin\left(\frac{1}{z}\right)$.

   f) Write any three characteristics of chi square Distribution.

   g) Write the test statistic for testing the equality of two population means for small samples and large samples.

   h) What is the maximum error one can expect to make with the probability 0.90, when using the mean of random sample 64 to estimate population mean with σ = 1.6

(2M+3M+2M+3M+3M+3M+3M+3M)

PART-B

2. a) Find the Analytic function given that $v + u = \frac{2\sin 2x}{e^{2y} + e^{-2y} - 2\cos 2x}$.

   b) Prove that an analytic function with constant real part is constant.
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3. a) Evaluate $\int_c \frac{ze^z}{(z-a)^3}dz$ where the point 'a' lies within the closed curve c by Cauchy integral formula.

   b) Obtain Laurent's expansion for $f(z) = \frac{1}{(z+2)(z+1)^2}$ in $|z+1| > 1$

4. a) Evaluate $\int_0^{2\pi} \frac{d\theta}{3+2\cos\theta}$.

   b) Evaluate $\int_0^{\infty} \frac{x^2 dx}{(x^2+1)^2}$.

5. a) Discuss the transformation $w = e^z$.

   b) Find the Bilinear transformation which maps z = 1, *i,* -1 onto w = *i, 0,-i.*

6. a) Write a short note on properties of Estimators.

   b) A random sample of size 50 is taken from normal population with mean 55 and S.D 15. What is the probability that the mean of samples will i) exceed 57 ii) less than 60 (iii) between 53 and 58

7. a) A college management claims that 80% of all single women appointed for teaching job get married and quit he job within two years of time. Test this hypothesis at 5% level of significance if among 200 such teachers, 112 got married within two years and quit their jobs.

   b) Two investigations study the income of group of persons by the method of sampling. Following results were obtained

Investigator	Poor	Middle	Well
A	160	30	10
B	140	120	40

   Show that the sampling technique of at least one of the investigators is suspected at 5% level.

Code No: RT21021 **R13** SET - 1

II B. Tech I Semester Regular Examinations, Dec - 2014
ELECTRICAL CIRCUIT ANALYSIS - II
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Given that voltage $V_{bn} = 110 \angle 30^0$ in a balanced 3-phase system. Find V_{an} and V_{cn} assuming a positive phase sequence (ABC).
   b) State the two ways in which phases of a three phase supply can be interconnected to reduce the number of conductors used compared with three single-phase systems .
   c) A circuit consists of a resistor connected in series with a 0.5 μF capacitor and has a time constant of 12 milli-sec. Determine the value of the resistor and capacitor voltage at 7 milli-sec after connecting the circuit to a 10 V supply.
   d) Find the admittance parameters for the network shown below Figure 1.
   e) Write the condition for symmetry and reciprocity with reference to h-parameters?
   f) The voltage and current at the terminals of a circuit are $v(t) = 80 + 120 \cos 120\pi t + 60 \cos (360\pi t - 300)$ and $i(t) = 5 \cos(120\pi t - 10^0) + 2 \cos(360\pi t - 60^0)$. Find the average power absorbed by the circuit.
   g) For the circuit shown below Figure 2, find $i_L(\infty)$, $v_C(\infty)$ and $v_R(\infty)$.
   h) List any three properties of Fourier Transform? (3M+3M+3M+2M+2M+3M+3M+3M)

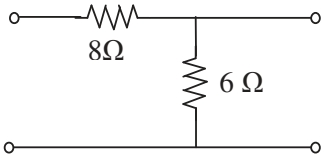

Figure 1

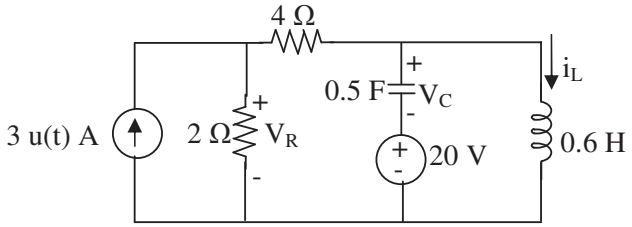

Figure 2

PART-B

2. a) A three-phase, three-wire, ABC system, with an effective line voltage of 120 V, has three impedances of $5\angle 45^0 \Omega$ in a delta connection. Determine the line currents and draw the voltage and current phasor diagram.
   b) Explain, with a neat sketch, how a three phase power is measured in delta connected load using two watt meters? (8M+8M)

3. a) A three-phase, three-wire, ABC system, with line voltage $V_{BC} = 311.1\angle 0^0$ V has line currents $I_A = 61.5 \angle 116.6^0$ A, $I_B = 61.2 \angle -48^0$ A and $I_C = 16.1\angle 218^0$ A. Find the readings of watt meters in lines i) A and B, ii) B and C, and iii) A and C
   b) A balanced three-phase star-connected generator with Vp = 220 V supplies an unbalanced star-connected load with $Z_{AN} = 60 + j80\ \Omega$, $Z_{BN} = 100 - j120\ \Omega$, and $Z_{CN} = 30 + j40\Omega$. Find the total complex power absorbed by the load. (8M+8M)

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4. a) An un-charged 80 μF capacitor is connected in series with a 1 kΩ resistor and is switched across a 110V supply. Determine the time constant of the circuit and the initial value of current flowing. Also, determine the value of current flowing after i) 40 ms and ii) 80 ms.
   b) Referring to the circuit shown in Figure 3, the switch is closed at t = 0. i) Determine equations for i_L and v_L. ii) At t = 300 ms, open the switch and determine equations for i_L and v_L during the decay phase. iii) Determine voltage and current at t = 100 ms and at t =350 ms. iv) Sketch i_L and v_L (7M+9M)

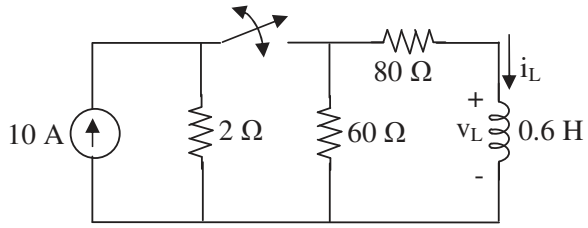

Figure 3

5. a) Obtain the y-parameters for the network shown in Figure 4.
   b) Derive relationship between hybrid and Z-parameters of two port network? (8M+8M)

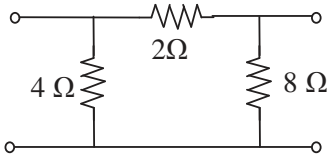

Figure 4

6. a) List the properties of positive real function and test whether the following function is positive real or not? $F(s) = \dfrac{s^2+4}{s^3+3s^2+3s+1}$
   b) Determine the Foster I form of realization of the RC impedance function. (8M+8M)

$$Z(s) = \frac{(s+1)(s+3)}{s(s+2)(s+4)}$$

7. a) Find the Fourier series of the square wave shown in Figure 5. Plot the amplitude and phase spectra.
   b) Using the Fourier transform method in Figure 6, find $i_o(t)$,when $i_s(t) = 10 \sin 2t$ A. (8M+8M)

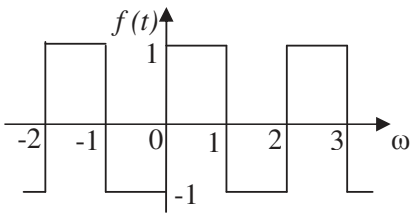

Figure 5

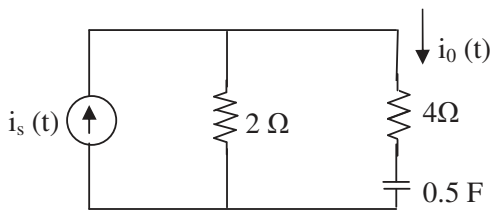

Figure 6

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II B. Tech I Semester Regular Examinations, Dec - 2014
ELECTRICAL CIRCUIT ANALYSIS - II
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Write the relationships between line and phase currents and line and phase voltages for a star and delta connected system.
   b) Write the differences between balanced and unbalanced 3-phase systems.
   c) A capacitor of capacitance C farads is connected in series with a resistor of R ohms and is switched across a constant voltage DC supply of V volts. After a time of t seconds, the current flowing is *i* amperes. Write the expression for voltage drop across the resistor at time *t* seconds? What is the expression for final value of capacitor voltage?
   d) Find the impedance parameters for the network shown below Figure 1.
   e) Write the condition for symmetry and reciprocity with reference to ***y*** and ***h***-parameters?
   f) The voltage and current at the terminals of a circuit are $v(t) = 80 + 120 \cos 120\pi t + 60 \cos(360\pi t - 30^0)$ & $i(t) = 5 \cos(120\pi t - 10^0) + 2 \cos(360\pi t - 60^0)$ Find the average power absorbed by the circuit.
   g) For the circuit shown above Figure 2, find $i_L(0^+)$, $v_C(0^+)$ and $v_R(0^+)$.
   h) List any three properties of Fourier Transform? (3M+2M+3M+3M+3M+3M+2M+3M)

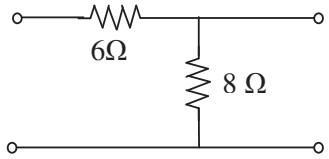

Figure 1

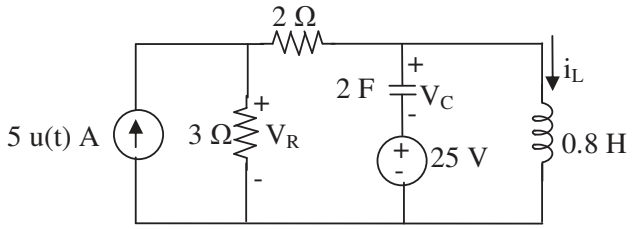

Figure 2

PART-B

2. a) In a three phase balanced load, each arm consists of a resistor of 10 ohms, an inductance of 0.6 H and a capacitor of 130 μF connected in series. The supply is a balanced 3-phase 400 V, 50 Hz. Calculate the line current, total power consumed in the load when the three arms are connected in star and delta.
   b) Three identical coils, each of resistance 10 Ω and inductance 42 mH are connected (i) in star and (ii) in delta to a 415V, 50 Hz, 3-phase supply. Determine the total power dissipated in each case. (8M+8M)

3. a) A four-wire star-star circuit has $V_{an} = 120\angle 120^0$, $V_{bn} = 120\angle 0^0$ $V_{cn} = 120\angle -120^0$ V. If the impedances are $Z_{an} = 20\angle 60^0$, $Z_{bn} = 30\angle 0^0$ and $Z_{cn} = 40\angle 30^0$ Ω, find the current in the neutral line.
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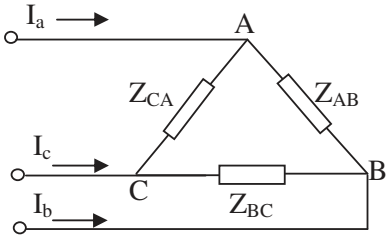
b) For the circuit shown in figure 3, the line voltage is 240 V. Take V_{ab} as reference and determine following: i) phase currents, ii) line currents, iii) total power absorbed in the load. Also draw phasor diagram. (8M+8M)



$Z_{AB} = 25\Omega$

$Z_{BC} = 12\angle 60^0\,\Omega$

$Z_{CA} = 16\angle -30^0\,\Omega$

Figure 3

4. a) Derive an expression for the current in an RL circuit when it is excited by a unit step voltage.
   b) In a series RLC circuit L=0.5 H, and C=2 F. A DC voltage of 20 V is applied at t=0. Obtain an expression for current *i* (t) in the circuit, when (i) R= 3 Ω, (ii) R= 4 Ω, (iii) R=6 Ω. (8M+8M)

5. a) Obtain the y-parameters for the network shown in Figure 4.
   b) Find the hybrid parameters of the network shown in Figure 5. (8M+8M)

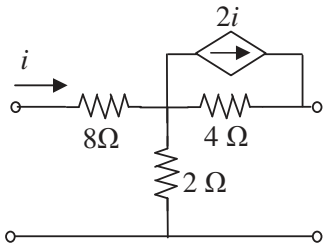


Figure 4

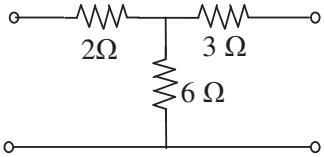


Figure 5

6. a) Find the first Foster form of LC network for the impedance function $Z(s) = \dfrac{s(s^2+2)}{(s^2+1)(s^2+3)}$

   b) Obtain the Cauer form I realization of $F(s) = \dfrac{2(s+1)(s+3)}{s(s+2)}$ (8M+8M)

7. a) A series RLC circuit has R = 10 Ω, L = 2 mH, and C = 40 μF. Determine the effective current and average power absorbed when the applied voltage is v(t) = 100 cos 1000t + 50 cos 2000t + 25 cos 3000t V.
   b) Using the Fourier transform method, Find the current $i_o(t)$ in the circuit shown in Figure 6. Given that i_s (t) = 20 cos 4t A. (8M+8M)

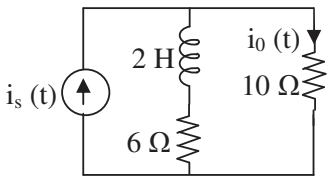


Figure 6

Code No: RT21021 **R13** SET - 3

II B. Tech I Semester Regular Examinations, Dec - 2014
ELECTRICAL CIRCUIT ANALYSIS - II
(Electrical and Electronics Engineering)

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2. Answer **ALL** the question in **Part-A**
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PART-A

1. a) Write the formulae for determining the active and reactive power dissipated in the load of a three-phase balanced system .
   b) What are the reasons for unbalance of phases in a 3-phase system?
   c) For the circuit shown below Figure 1, if $v = 15e^{-3t}$ V and $i = 0.5e^{-3t}$ A, t>0, find R &C.
   d) Write the set of equations which describe the admittance parameters and explain each term?
   e) Write the condition for symmetry and reciprocity with reference to transmission and Z-parameters?
   f) List any three properties of Fourier Transform?
   g) The voltage and current at the terminals of a circuit are $v(t) = 80 + 120 \cos 120\pi t + 60 \cos(360\pi t - 30^0)$ and $i(t) = 5 \cos(120\pi t - 10^0) + 2 \cos(360\pi t - 60^0)$ Find the rms value of the current and average power absorbed by the circuit.
   h) For the circuit shown Figure 2, find $i_L(0^-)$, $v_C(0^-)$ and $v_R(0^-)$.

(2M+3M+2M+3M+3M+3M+3M+3M)

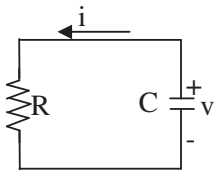

Figure 1

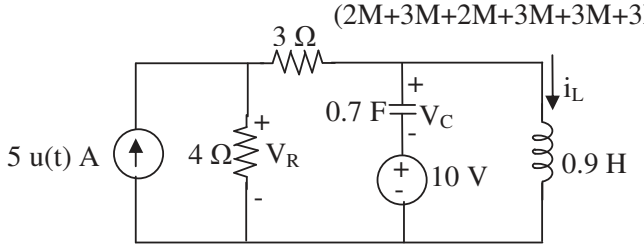

Figure 2

PART-B

2. a) Show that the total power in a 3-phase, 3-wire system using the two-wattmeter method of measurement is given by the sum of the wattmeter readings. Draw a connection diagram and phasor diagram. Also derive the expression for power factor in terms of two wattmeter readings
   b) Each phase of a delta-connected load comprises a resistance of 30Ω and an 80 μF capacitor in series. The load is connected to a 400V, 50 Hz, 3-phase supply. Calculate (i) the phase current, (ii) the line current, (iii) the total power dissipated and (iv) the kVA rating of the load. Draw the complete phasor diagram for the load. (8M+8M)
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3. A three phase 400 V star connected balanced supply is connected to star connected three load of $15\angle 0^0\ \Omega$, $12\angle -20^0\ \Omega$, and $18\angle 10^0\ \Omega$, Find line current, power and current in neutral of the (i) four wire system (ii) three wire system. Assume zero neutral impedance. (16M)

4. a) Derive an expression for voltage across 'R' in a series R-C circuit excited by a unit step voltage. Assume zero initial conditions.
   b) i) If the switch in Figure 3, has been open for a long time and is closed at t = 0, find $V_o(t)$.
   ii) In Figure 3, suppose that the switch has been closed for a long time and is opened at t= 0. Find $V_o(t)$. (8M+8M)

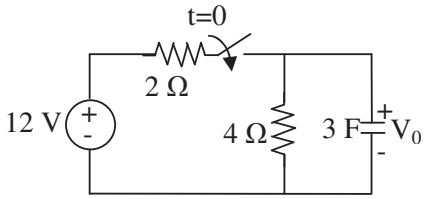

Figure 3

5. a) Find the transmission parameters of the network shown Figure 4.
   b) Determine h-parameters of a two-port network whose z parameters are $Z_{11}= Z_{22}=6$ ohms and $Z_{12}=Z_{21}=4$ ohms. (8M+8M)

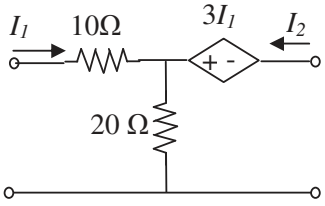

Figure 4

6. a) List the properties of positive real function and test whether the following function is positive real or not? $F(s)=\frac{s(s^2+6)}{(s^2+3)^2}$

   b) Realize the driving point impedance function $Z(s)=\frac{(s+2)(s+5)}{(s+1)(s+3)}$ in Foster form – II.

(8M+8M)

7. a) The full-wave rectified sinusoidal voltage in Figure 5 is applied to the low-pass filter in Figure 6. Obtain the output voltage $V_o(t)$ of the filter.
   b) Calculate the Fourier series for the function shown Figure 7. (8M+8M)

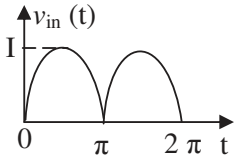

Figure 5

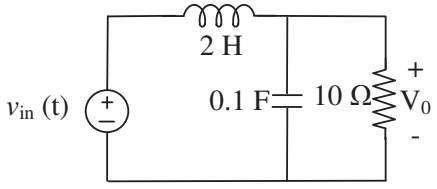

Figure 6

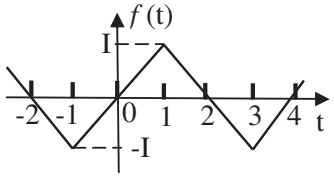

Figure 7

Code No: RT21021 **R13** SET - 4

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2. Answer **ALL** the question in **Part-A**
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PART-A

1. a) Name three advantages of three-phase systems over single-phase systems
   b) Write a formula for a power factor in a balanced system 3-phase system when the power is measured by two-wattmeter method.
   c) For the circuit shown below Figure 1, if v = $20e^{-4t}$ V and i = $0.5e^{-4t}$ A, t>0, find time constant of the circuit
   d) What is meant by time constant of a R-L circuit? What are its applications in power system.
   e) Write the conditions for symmetry and reciprocity with reference to h-parameters?
   f) The voltage and current at the terminals of a circuit are v(t) = 80 + 120 cos 120πt + 60 cos ($360\pi t - 30^0$) and i(t) = 5 cos($120\pi t - 10^0$) + 2 cos($360\pi t - 60^0$). Find the r.m.s value of the current and average power absorbed by the circuit.
   g) For the circuit shown below Figure 2, find $i_L(0^+)$, $v_C(0^+)$ and $v_R(0^+)$.
   h) List any three properties of Fourier Transform? (3M+2M+2M+3M+3M+3M+3M+3M)

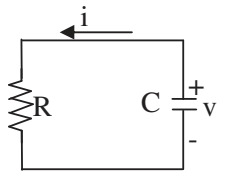

Figure 1

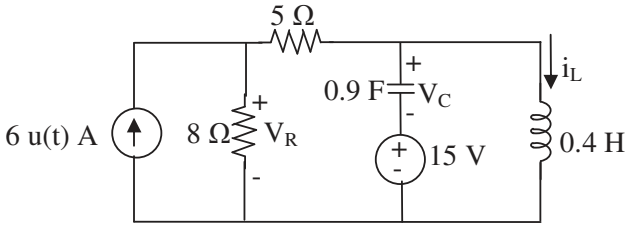

Figure 2

PART-B

2. a) Explain the method of measuring reactive power in a 3-phase balanced system using a single watt meter method.
   b) The two-wattmeter method gives P_1 = 1200 W and P_2 = −400 W for a three-phase motor running on a 240-V line. Assume that the motor load is star connected and that it draws a line current of 6 A. Calculate the pf of the motor and its phase impedance. (8M+8M)
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Code No: RT21021 **R13** SET - 4

3. a) For the circuit shown figure 3, $Z_a = 6 - j8\ \Omega$, $Z_b = 12 + j9\Omega$, and $Z_c = 15\ \Omega$. Find the line currents I_a, I_b, and I_c.
   b) A balanced three-phase star-connected generator with $V_p = 220$ V supplies an unbalanced star-connected load with $Z_{AN} = 60 + j80\ \Omega$, $Z_{BN} = 100 - j120\ \Omega$, and $Z_{CN} = 30 + j40\Omega$. Find the total complex power absorbed by the load. (8M+8M)

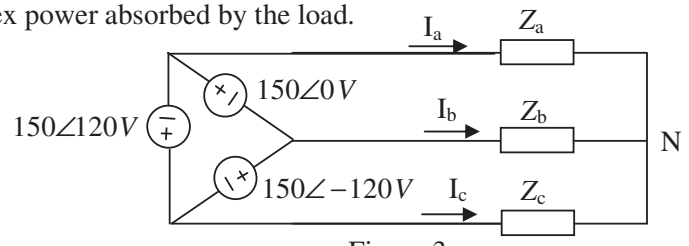

Figure 3

4. a) Find the voltage across the capacitance for t > 0 in the circuit shown in Figure 4.
   b) For the circuit shown in figure 5, calculate (i) $i_L(0+)$, $v_C(0+)$, and $v_R(0+)$, (ii) $i_L(\infty)$, $v_C(\infty)$, and $v_R(\infty)$. (8M+8M)

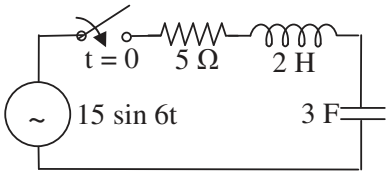

Figure 4

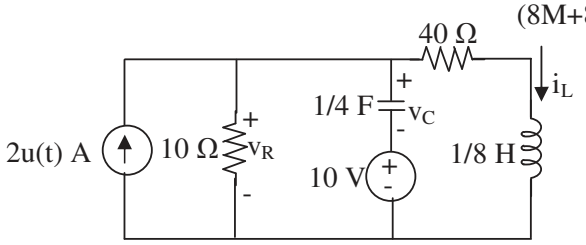

Figure 5

5. a) Determine the z-parameters for the circuit shown below Figure 6.
   b) Determine the y-parameters for the circuit shown Figure 7. (8M+8M)

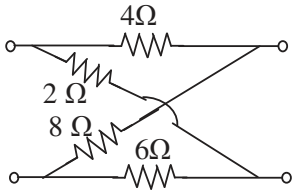

Figure 6

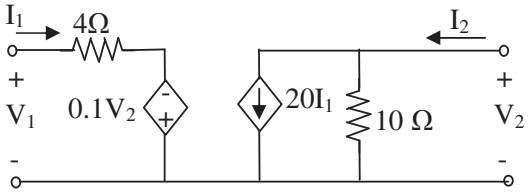

Figure 7

6. a) Synthesize F(s) = 2 (s+1) (s+4) / (s+2) (s+6) in two Cauer forms?
   b) List the properties of positive real function and test whether the following function is positive real or not? $F(s) = \dfrac{s^2 + 4}{s^3 + 6s^2 + 6s + 2}$. (8M+8M)

7. a) A series RL circuit in which R = 5 Ω and L =20 mH has an applied voltage v =100 + 50 sin ωt +25 sin 3ωt (V), with ω= 500 rad/s. Find the current and the average power.
   b) Obtain the Fourier transform of the "switched-on" exponential function shown Figure 8. (8M+8M)

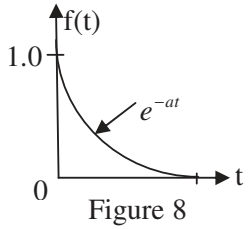

Figure 8

Code No: RT21026 **R13** SET - 1

II B. Tech I Semester Regular Examinations, Jan - 2015
ELECTRICAL MACHIENS-I
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

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PART-A

1. Answer the following in 4 or 5 sentences each
   a) In every electromechanical conversion systems, both generator and motor action take place simultaneously. Justify your answers.
   b) Explain how torque is produced in a rotating electrical machine.
   c) Explain the function of commutator in a dc machine.
   d) Why no-volt release coil is provided in a dc motor starter.
   e) Explain how the hysteresis loss can be reduced.
   f) What are the advantages and disadvantages of specific electric and magnetic loadings
   g) An 8-pole lap-wound dc generator armature has 960 conductors, a flux of 40 mWb and a speed of 400 rpm. Calculate the e.m.f generated on open circuit.
   h) What is the use of equalizer connections in lap wound dc machines?
   i) What is 'back e.m.f' in dc machine? What is its significance?
   j) What is the difference between 3-point and 4-point starters?
   k) What are the different methods of braking? (2M×11=22M)

PART B

2. a) Explain the principle of energy conversion. Draw and explain general representation of electro-mechanical conversion device.
   b) For a linear magnetic circuit derive the expressions for the stored energy and co-energy.

3. a) Explain the process of commutation in a dc machine and discuss the methods to improve it.
   b) A 4-pole wave wound generator armature has 722 conductors, and it delivers 100 A on full load. If the brush lead is 8^0, calculate the armature demagnetizing and cross-magnetizing ampere-turns per pole.
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4. a) Draw and explain the no-load and load characteristics of shunt, series and compound generators. Give the applications of different types of dc generators with reasons and justification

   b) A 10 kW, 250V dc shunt generator has total no load rotational loss of 400W. The armature circuit including brushes and shunt field resistance are 0.5 and 250 ohms respectively. Calculate the shaft power input and the efficiency at rated load. Also calculate the maximum efficiency and the corresponding power output.

5. a) What are the drawbacks of three point starters? Describe a four-point starter with a neat sketch.

   b) A 250V, 4-pole, shunt motor has two-circuit armature winding with 500 conductors. The armature circuit resistance is 0.25 ohms, field resistance is 100 ohms and the flux per pole is 0.03Wb. If the motor draws 14.5A from the mains, compute the speed and the internal (gross) torque developed. Neglect armature reaction.

6. a) What is meant by braking of dc motors? Briefly describe various methods of braking of dc shunt motors.

   b) A 500V shunt motor runs at its normal speed of 250 rpm when the armature current is 200A and resistance of armature is 0.12 ohms. Calculate the speed when a resistance is inserted in the field, reducing the shunt field to 80% of normal value, and the armature current is 100A.

7. a) What factors need to be considered for choice of ampere conductors in dc machines?

   b) List advantages and disadvantages of higher number of poles in dc machine.

Code No: RT21026 **R13** SET - 2

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ELECTRICAL MACHIENS-I
(Electrical and Electronics Engineering)

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PART-A

1. Answer the following in 4 or 5 sentences each
   a) Write the energy balance equation and explain each term.
   b) What is meant by reactance voltage and how it will be neutralized?
   c) Give the reasons for failure of self excited generator to build up.
   d) What is the necessity of a starter for dc motor?
   e) What is the disadvantage of Swinburne's test?
   f) What is resistance commutation?
   g) A series generator delivers a current of 100A at 250V. Its armature and field resistances are 0.1 ohm and 0.55 ohm respectively. Find (i) armature current (ii) generated e.m.f
   h) What are the causes of sparking in dc machines?
   i) Differentiate between the generator action and motor action of a dc machine?
   j) Explain the causes of hysteresis and eddy current losses in electric machines. On what factors do these losses depend?
   k) What are commutating poles? Why are they used? (2M×11=22M)

PART B

2. a) Explain the term 'co-energy' in electromechanical energy conversion and show that co-energy is given by: $W_f = 1/2\ PF^2$ where P = permeance of the magnetic circuit and F = mmf in coil of magnetic circuit.
   b) Discuss singly and multiply excited magnetic field systems.
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3. a) Explain the function of interpoles in the generators with neat diagrams.
   b) A four pole, 23.75 kW, 250V lap wound dc shunt generator has 50 slots with 8 conductors per slot and shunt field resistance of 50Ω. The brushes are given a lead of 8^0 (mech) when the generator delivers full load current. Calculate the number of turns on the compensating winding if the pole arc to pole pitch ratio is 0.8.

4. a) Explain various power stages in a DC generator and also derive the condition for maximum efficiency
   b) A 10 kW, 250V DC, 6 pole shunt generator runs at 1000 rpm when delivering full load. The armature has 534 lap connected conductors. Full load copper loss is 0.64 kW. The total brush drop is 1V. Determine the flux per pole. Neglect shunt current.

5. a) Plot the speed-torque characteristics of different types of dc motors. Based on these characteristics specify the applications of dc motors.
   b) A 230V dc shunt generator has armature and field resistances of 0.06 ohms and 100 ohms respectively. Determine the total armature power developed when working (i) as generator delivering 25 kW output and (ii) as a motor taking 25 kW input.

6. a) What are the different types of speed control methods for dc motors? Discuss merits and demerits of each method.
   b) The Hopkinson's test on two shunt machines gave for full load the following results: Line voltage = 250V, Line current excluding field currents = 50A, Motor armature current = 380A, Field currents = 5A and 4.2A. The armature resistance of each machine is 0.02 ohm. Calculate efficiency of each machine.

7. a) On what factors does the length of the air gap in dc machines depend? Explain.
   b) Find an expression of minimum number of coils required in armature winding such that the maximum voltage between consecutive segments does not exceed beyond 30V.

Code No: RT21026 **R13** SET - 3

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(Electrical and Electronics Engineering)

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PART-A

1. Answer the following in 4 or 5 sentences each
   a) Give the examples of singly excited and doubly excited electro mechanical energy devices and also write the energy equations.
   b) What is back e.m.f in dc machine? What is its significance?
   c) Differentiate between Lap and Wave windings in dc machines and mention the relative merits and demerits.
   d) An 8-pole wave connected dc generator has 1000 armature conductors and flux/pole is 0.035Wb. At what speed it must be driven to generate 500V on open circuit.
   e) What is the need of testing dc machine and what are the different tests to be conducted on different machines
   f) What are the advantages and disadvantages of specific electric and magnetic loadings?
   g) The shunt field winding has high resistance while series field has a low resistance. Why?
   h) In what type of dc machine wave winding is employed and why?
   i) Explain the term commutation period?
   j) Explain how torque is produced in a rotating electrical machine.
   k) What are interpoles? Why are they used? (2M×11=22M)

PART B

2. a) For a singly-excited magnetic system, derive the relation for the magnetic stored energy in terms of reluctance.
   b) Determine the necessary expressions for determining the force and torque in multi excited magnetic field system.
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3. a) What is meant by commutation? Explain how spark-less commutation is obtained in a dc generator, with neat diagrams.
   b) A 4 pole 40 kW, 200V wave wound shunt generator has 420 conductors. Brushes are given a lead of 5 commentator segments. Calculate the demagnetizing amp-turns per pole if shunt field resistance is 40 ohm. Also calculate extra shunt field turns/pole to neutralize the demagnetization.

4. a) What is a compound generator? Differentiate between over, level and differential compounding? Draw external characteristics for these generators?
   b) A DC shunt generator running at 1000 r.p.m gave the following O.C.C.

Field current (Amps):	1	2	3	4	5	6	7	8
EMFs (Volts):	52.5	107.5	155	196.5	231	256.5	275	287.5

   Calculate the voltage to which the machine will build up if the speed is 800 r.p.m and the field circuit resistance is 30 ohms.

5. a) Explain the working principle of a 3 point starter of a dc shunt motor with neat diagram.
   b) A 440V shunt motor takes 105A (Armature current) from the supply and runs at 1000 r.p.m. Its armature resistance is 0.15 ohm. If the total torque developed is unchanged, calculate the speed and armature current if the magnetic field is reduced to 70% of the initial value.

6. a) Explain Retardation test with a neat diagram.
   b) The armature and shunt field resistances of a 500V shunt motor are 0.2 ohm and 100 ohms respectively. Fine the resistance of the shunt field regulator to increase the speed from 800 r.p.m to 1000 r.p.m, if the current taken by the motor is 450A. The magnetization characteristics may be assumed as straight line.

7. a) Derive the expression for output equation of a dc machine.
   b) List the factors to be considered for selecting the number of armature slots

Code No: RT21026 **R13** SET - 4

II B. Tech I Semester Regular Examinations, Jan - 2015
ELECTRICAL MACHIENS-I
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. Answer the following in 4 or 5 sentences each
   a) Define field energy and co-energy?
   b) What is meant by reactance voltage?
   c) Prove that speed control characteristic of a dc shunt motor by flux control method is hyperbola.
   d) What are commutating poles? Why are they used?
   e) What is the need of testing dc machine and what are the different tests to be conducted on different machines
   f) What are the advantages and disadvantages of specific electric and magnetic loadings
   g) What purpose is served by brushes in a dc machine?
   h) Why are field coils provided in a dc generator?
   i) How are interpoles excited?
   j) What is the significance of back e.m.f in dc machine?
   k) Explain how the eddy current loss can be reduced. (2M×11=22M)

PART B

2. a) Prove that the energy and co-energy in a linear magnetic system are given by identical expressions.
   b) Determine the necessary expressions for determining the force and torque in multi excited magnetic field system.
~~~~~~

3. a) Explain the action of compensating windings used in dc machines. Show schematically how they are interconnected?
   b) A 4 pole wave connected generator supplied 134 A. It has 492 armature conductors. When delivering full load the brushes are given an actual lead of 10^0. Calculate the demagnetizing ampere turns per pole. The shunt field winding takes 10A. Find extra shunt field turns necessary to neutralize this demagnetization.

4. a) With the help of suitable diagrams explain different methods of excitation of dc generators?
   b) The open circuit characteristic of a separately exited generator at 600 r.p.m is as under:

Field current (Amps):	1.6	3.2	4.8	6.4	8.0	9.6	11.2
EMFs (Volts):	148	285	390	460	520	560	590

   Find (i) The voltage to which the machine will excide as a shunt generator with a field circuit resistance of 60 ohm (ii) Critical resistance at this speed.

5. a) Explain speed-current, torque-current and speed-torque characteristics of a dc series motor.
   b) Why is starting current high in a dc motor? Explain the working of a four-point starter for a dc machine.

6. a) Explain "Hopkinson's" test. Why it is called a regenerative test?
   b) A 220V DC shunt motor draws a no-load current of 2.5A when running at 1400 r.p.m. Determine its speed when taking an armature current of 60A, if armature reaction weakens the flux by 3%.

7. a) On what factors does the length of the air gap in dc machines depend? Explain.
   b) Find an expression of minimum number of coils required in armature winding such that the maximum voltage between consecutive segments does not exceed beyond 30V.

Code No: RT21025 **R13** SET - 1

II B. Tech I Semester Regular Examinations, Jan - 2015
ELECTRO MAGENETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Define electric field intensity and electric potential and write the relationship between them.
   b) In a certain region, the potential is given by $V = (x^2 + 3y^2 + 9z)$. Find the electric field intensity at point P(1, -2, 3) m.
   c) What is the capacitance of a parallel plate capacitor when the stored energy is 5 μJ and the voltage across the plates is 5 V?
   d) What is a dipole? Write the expression for electric potential due to a dipole.
   e) State Biot-Savart's law. Give its limitation.
   f) Define magnetic dipole and magnetic dipole moment.
   g) A solenoid with air core has 2000 turns and a length of 500 mm. Core radius is 40 mm. Find its inductance.
   h) What is Poyting vector? Write its significance. (2M+3M+3M+3M+2M+3M+3M+3M)

PART-B

2. a) Determine the electric field intensity due to infinite line charge, at a point perpendicular to its plane and at a given distance from the line charge from first principles.
   b) Find the electric field at distance 'z' above the center of a flat circular disc of radius 'r', which carries a uniform surface charge σ. (8M+8M)

3. a) The space between two large parallel plates separated by a distance d=1 mm is filled with dielectric of relative permeability 20. Determine the polarization vector of dielectric if the plates are connected to (i) 10 V battery (ii) 20 V battery (iii) 100 V battery and (iv) 50 V battery
   b) Show that the torque on a physical dipole $\overline{P}$ in a uniform electric filed $\overline{E}$ is given by $\overline{P} \times \overline{E}$. Extend this result to a pure dipole. (8M+8M)

4. a) The region is a free space enclosed by planes $z = 0$ *and* $z = 5\ cm$, and by cylinders $\rho = 3\ cm$ *and* $\rho = 7\ cm$, forms a toroid with a rectangular cross-section. A surface current, $K = 100\ \vec{z}\ A/m$ flows on the inner surface. Find the total flux and magnetic field intensity within the toroid
   b) State and explain Amperes current law and derive the same in point differential form. (8M+8M)
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5. a) State and explain Lorentz's force equation?
   b) A current filament carrying 10 A in z direction lies along the entire z axis in free space. A rectangular loop connecting A (0,2,0) to B(0,2,3) to C(0,7,3) to D(0,7,2) to A (0,2,0) lies in the x = 0 plane. The loop current is 5 mA and it flows in the z-direction in the AB segment. Find forces on side AB and on side DA. (8M+8M)

6. a) Derive the mutual inductance between an infinitely long straight wire and a one-turn rectangular coil whose plane passes through the wire and two of whose sides are parallel to the wire. Take necessary assumptions.
   b) A toroidal core is composed of a material with relative permeability 25. The boundary surfaces are $z = 0, z = 0.05, \rho = 0.05$ *and* $\rho = 0.08\ m$. The core is wound symmetrically with 10000 turns so that H is in $\vec{\phi}$ direction. If the current in the coil is 20 A, find the total stored energy. (8M+8M)

7. a) Show that power loss in a conductor is given as product of voltage and current using Poynting theorem.
   b) State the Faraday's laws of electromagnetic induction and derive the expressions for the transformer and motional e.m.f.s. (8M+8M)

Code No: RT21025 **R13** SET - 2

II B. Tech I Semester Regular Examinations, Jan - 2015
ELECTRO MAGENETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) State the differences between Laplace's and Poisson's equations.
   b) Why Gauss's law cannot be applied to determine electric field due to finite line charge.
   c) Distinguish between the conduction current and convection current.
   d) What are the boundary conditions for perfect dielectric materials?
   e) What are the limitations of Ampere's circuital law?
   f) What is the significance of Lorentz force equation?
   g) Define statically and dynamically induced EMF.
   h) Write expression for self and inductance of a solenoid and toroid.
   (3M+3M+3M+3M+3M+3M+2M+2M)

PART-B

2. a) Four 3 nC charges are at corners of a 2-m square. The top corner charges positive where as the bottom corner charges are negative. Find the electric field at the center of the square. Assume $\epsilon_r = 1$
   b) State and explain Coulomb's law. (9M+7M)

3. a) A parallel plate capacitor consists of two square metal plates of side 500mm and separated by a 10 mm slab of Teflon with $\varepsilon_r = 2$ and 6 mm thickness is placed on the lower plate leaving an air gap of 4mm thick between it and upper plate. If 100v is applied across the capacitor, find D, E, and V in Teflon and air.
   b) Derive continuity equation.
   c) State and prove the conditions on the tangential and normal components of electric flux density and electric field intensity, at the boundary between the dielectrics. (6M+5M+5M)

4. a) Show that $\nabla \times H = J$.
   b) Derive expression for magnetic flux density at a point due to long current carrying filament.
   (8M+8M)
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5. a) A two wire line consists of two conductors of infinite length and circular cross section of radius 10 cm and the distance between them is 1 m. The two conductors are short circuited by a straight conducting bar. What is the force on the bar, if the current through the bar is (i) 10 A and (ii) 20 A ?

   b) A rectangular loop is carrying a current of 20 A in anti clockwise direction in the presence of a magnetic field $\vec{B} = (3x\vec{x} + 6y\vec{y} + 9z\vec{z})\ T$. If the loop lies in z = 0 plane and is bounded by $x = 2, x = 4, y = 1$ and $y = 3\ m$. Find

   i) The force at $y = 1, x = 2$ to $x = 4$

   ii) The force at $y = 3, x = 2$ to $x = 4$ (8M+8M)

6. a) Derive an expression for mutual inductance between a straight long wire and a square loop wire in the same plane.

   b) A solenoid of 10 cm in length consists of 1000 turns having the cross section radius of 1 cm. Find the inductance of solenoid. What is the value of current required to maintain a flux of 1 milli-Wb in the toroid. Take $\mu_r = 1500$. (8M+8M)

7. a) Derive the Maxwell's equations in point and integral form for time varying fields?

   b) Starting from Faraday's law of electromagnetic induction, derive $\nabla \times E = -\frac{\partial \vec{B}}{\partial t}$. (8M+8M)

Code No: RT21025 **R13** SET - 3

II B. Tech I Semester Regular Examinations, Jan - 2015
ELECTRO MAGENETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Verify the given potential field satisfies the Laplace equation: $V = (x^2 + 3y^2 + 9z)$.
   b) Write the limitations of Gauss law.
   c) Define polarization. Is polarization is present in conductors.
   d) Write the expression for torque developed on a dipole placed in an electric field.
   e) State Ampere's circuital law.
   f) What is a magnetic dipole? How it is differ from electric dipole.
   g) State Faraday's law of electromagnetic induction.
   h) Write the expression for energy stored in a magnetic field.
   (3M+3M+3M+3M+3M+3M+2M+2M)

PART-B

2. a) A point charge of 10 C is located at (1,1,2) in free space, while a charge of 1 C is at (4,1,3). Find the coordinates of the point at which a point charge experience no force.
   b) State and prove Gausss's Law. (8M+8M)

3. a) A conductor of circular cross section is constructed of steel whose conductivity is $6 \times 10^6\ S/m$ in the region $0 < r < 1\ mm$, copper whose conductivity $5.8 \times 10^7\ S/m$ in the region $1 < r < 2\ mm$ and nichrome whose conductivity $10^6\ S/m$ in the region $2 < r < 3\ mm$, the total current carried by the conductor is 100 A. Calculate the current density in steel, copper and nichrome
   b) A dipole with $p = 3\,\vec{z}\ \mu Cm$ is located at point (0,0,2) in free space, and the z = 0 plane is perfectly conducting. Find potential at (0,1,2), (0,2,3) and (0,3,4) (8M+8M)
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4. a) A conductor in the form of regular polygon of '*n*' sides inscribed in a circle of radius '*R*'. Show that the expression for magnetic flux density $B = \frac{\mu_0 nI}{2\pi R} tan\left(\frac{\pi}{n}\right)$ at center, where I is the current. Show also when 'n' is infinitely increased, the expression is reduced to $B = \frac{\mu_0 I}{2R}$.
   b) Derive the expression for magnetic field intensity at the center of a circular wire. (8M+8M)

5. a) Two parallel circular loops of radii 10 m and 2 m, are coaxially located and carry currents 20 A and 5 A respectively. Find the force between the loops if the axial distance between the centers of the loops is (i) 30 m (ii) 40 m
   b) Three infinitely long parallel filaments each carry 5 A in z-direction. If the filament lie in the plane x = 0 and with a 2 cm spacing between wires. Find
   i) The force per meter on left filament
   ii) The force per meter on center filament (8M+8M)

6. a) A solenoid is wound on a long former, square in section and containing no magnetic material. It is bent round into a toroid of internal and external radii 3 cm and 21 cm respectively. A straight thin cable of infinite length passes along the axis of the toroid at right angles to its plane. Find the mutual inductance between the cable and solenoid if there are 200 number of turns per meter on solenoid
   b) Obtain an expression for the self-inductance of a toroid of a circular cross-section, with *N* closely spaced turns. (8M+8M)

7. a) Explain the concept of displacement current and obtain an expression for the displacement current density.
   b) A square loop of wire has corners at (0,0,0), (1,0,0), (1,1,0) and (0,1,0) at t = 0. The loop is perfectly conducting except for a small 100 Ω resistor in one side. It is moving through the field $\boldsymbol{B = 10\cos(5\times10^3 t - 2x)\vec{z}\ \mu T}$ with a constant velocity of $\boldsymbol{30\,\vec{y}\ m/s}$. Calculate the induced EMF (8M+8M)

Code No: RT21025 **R13** SET - 4

II B. Tech I Semester Regular Examinations, Jan - 2015
ELECTRO MAGENETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Given the potential field $V = 50x^2yz + 20y^2$ volts in free space. What is the electric field at a point P(1,2,-3).
   b) What is an equi-potential line? Give its properties.
   c) What is the capacitance of a parallel plate capacitor when the plate area is 1 m^2, distance between the plates is 1 mm, voltage gradient is 10^5 V/m and charge density on the plates is 2 $\mu C/m^2$?
   d) Write ohm's law in point form and give its significance.
   e) Write the relationship between magnetic flux and magnetic flux density.
   f) What is the force per meter length between two long parallel wires separated by 10 cm in air and carrying a current of 100 A in the same direction.
   g) Define self and mutual inductances
   h) State Poynting theorem. (3M+2M+3M+3M+2M+3M+3M+3M)

PART-B

2. a) Two concentric coplanar rings of radii 1 cm and 4 cm carry charges -2 nC and 3 nC respectively. Find the distance of the equilibrium point from the center of the ring.
   b) Find the work done in moving a 10 coulomb charge from infinity to the origin in electric filed $\overline{E} = \frac{50r}{(r^2+1)}\hat{a}_r$. (8M+8M)

3. a) Derive an expression for Capacitance of a parallel plate capacitor with two different media.
   b) A square parallel plate capacitor 200 mm on side with a plate spacing of 25mm is filled with a dielectric slap (ε_r =240 of the same dimensions if 100 V is applied to the capacitor) Find: (i) the polarization P in the dielectric and (ii) the energy stored by the capacitor.
   If the voltage source is now disconnected and the dielectric slap then slipped out from between the plates, find (iii) Polarization in the dielectric (iv) Energy stored in the dielectric (v) Energy stored in the capacitor. (8M+8M)
~~~~~~

4. a) A filamentary current of 15A is directed in from infinity to the origin on the positive x axis, and then back out to infinity along the position y axis. Use the Biot-Savart's law of find $\overline{H}$ at P (0, 0,1) ?
   b) Find the magnetic field intensity at centre of a square of sides equal to 5 m and carrying a current equal to 10 A. (8M+8M)

5. a) Two infinitely long parallel conductors are separated by a distance 'd'. Find the force per unit length exerted by one of the conductor on the other if the currents in the two conductors are I_1 and I_2.
   b) A straight solid wire segment carrying a current $4\vec{y}\ A$ extends from A(0,2,5) to B(0,6,5) in free space. This wire is subjected to the magnetic field of an infinite current filament lying along the z-axis and carrying 30 A in the z-direction. Find the torque on the wire segment about an origin at (0,0,2) and (0,0,0) (8M+8M)

6. a) A solenoid has dimensions L = 1 m, N = 1000 turns, diameter = 10 cm, and current I = 205 A. $\mu_r = 10$. Find the field and the energy density inside the solenoid
   b) Using basic laws, derive the expression for the self inductance (L) of a solenoid, if 'N' is the number of turns, 'μ' is permeability, 'A' is the cross sectional area, 'l' length of the flux path. (8M+8M)

7. a) From the Maxwell's equations, derive the expression for Poynting vector. Also, explain the applications of the Poynting vector.
   b) A conductor with circular cross-section has a radius 'a' and length 'l'. It is carrying a current 'I' ampere. If the conductivity of conductor is 'σ', find the power loss in the conductor using Poynting theorem. (8M+8M)

Code No: RT21022 **R13** SET - 1

II B. Tech I Semester Regular Examinations, Jan - 2015
THERMAL AND HYDRO PRIME MOVERS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) How heat engines are classified. Explain the principle of working of heat engine
b) Explain various operation of a Carnot cycle. Also represent it on T-s and P-V diagrams
c) What are the merits of Gas turbines over the IC engines
d) What are the applications of impulse-momentum equation?
e) Classify the hydraulic turbines
f) Explain about the load curve (3M+4M+4M+4M+4M+3M)

PART –B

2. a) With a neat sketch explain the working principle of a simple carburetor
b) Briefly discuss the air-fuel ratio requirements of a petrol engine from no load to full load. [8+8]

3. a) Explain about pressure compounding of impulse steam turbine with a neat sketch.
b) A simple Rankine cycle works between pressures 28 bar and 0.06 bar, the initial condition of steam being dry saturated. Calculate the cycle efficiency, work ratio and specific steam consumption. [8+8]

4. a) Explain the Inter cooling method applied to the gas turbine plant for improvement of the performance of plant with the help of P-V diagram and H-S diagram.
b) In an air standard gas turbine engine, air at a temperature of 15^0C and a pressure of 1.01 bar enters the compressor, where it is compressed through a pressure ratio of 5.Air enters the turbine at a temperature of 815^0C and expands to original pressure of 1.01 bar. Determine the ratio of turbine work to compressor work and the thermal efficiency when the engine operates on ideal Brayton cycle. Take □=1.4 and C_p=1.005kJ/kgK. [8+8]

5. a) Derive an expression for force exerted by a jet on a stationary flat plate held normal to the jet
b) Discuss the influence of exit blade angle on the performance and efficiency of a centrifugal pump. Assume radial flow at entrance. [8+8]

6. A pelton wheel is to be designed to the following specifications:
Power 11948 kW, Head 381m,Speed 750 rpm, overall efficiency 86% Jet diameter not to exceed 1/8 times the wheel diameter. Determine i) The wheel diameter ii) the number of jets required iii) The diameter of the jet. [8+8]

7. a) With a neat sketch explain the working of a simple hydro electric power plant identify all the components and explain their functionality
b) Explain the following: i) load factor ii) utilization factor iii) capacity factor [8+8]
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Code No: RT21022 **R13** SET - 2

II B. Tech I Semester Regular Examinations, Jan - 2015

THERMAL AND HYDRO PRIME MOVERS

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**

2. Answer **ALL** the question in **Part-A**

3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Compare External combustion engine and Internal combustion engines
   b) Explain the various operation of a Rankine cycle. Also represent it on T-s and P-V Diagrams
   c) What are the merits of Gas turbines over the IC engines
   d) Mention the parts of centrifugal pump. Explain the function of impeller
   e) What are the parameters to be considered while designing the Pelton Wheel?
   f) Explain the term diversity factor (4M+4M+4M+4M+3M+3M)

PART –B

2. a) What are the various components to be lubricated in an engine and explain how it is accomplished
   b) Compare the wet sump and dry sump lubrication systems [8+8]

3. a) Explain about the Re-heat cycle with the neat sketch
   b) In a steam turbine steam at 20 bar, 360^0C is expanded to 0.08 bar. It then enters a condenser, where it is condensed to saturated liquid water. The pump feeds back the water into the boiler. Assume ideal processes; find per kg of steam the net work and the cycle efficiency. [8+8]

4. a) Explain the Re-heat method applied to the gas turbine plant for improvement of the performance of plant with the help of P-V diagram and H-S diagram
   b) In an open cycle constant pressure gas turbine air enters the compressor at 1 bar and 300K.The pressure of air after the compression is 4 bar. The isentropic efficiencies of compressor and turbine are 78% and 85% respectively. The air fuel ratio is 80:1.Calculate the power developed and thermal efficiency of the cycle if the flow rate of air is 2.5 kg/s. Take C_p=1.005KJ/ KgK and □=1.4 and C_{pg}=1.147 KJ/KgK and □=1.33 for gases. R=0.287KJ/KgK Calorific value of fuel=42000KJ/Kg [8+8]

5. a) Derive an expression of the force exerted by a jet on a stationary flat plate held inclined to the jet
   b) Explain briefly the effect of variation of discharge on the efficiency [8+8]

6. A Pelton wheel having a mean bucket diameter of 1m is running at 1000 rpm. The net head on the Pelton wheel is 700m.If the side clearance angle is 15^0 and discharge through the nozzle is $0.1m^3/s$, determine power available at the nozzle and hydraulic efficiency of the turbine. [8+8]

7. a) Explain about the pumped storage systems in detailed
   b) Distinguish between a base load power plant and a peak load power plant [8+8]
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Code No: RT21022 **R13** SET - 3

II B. Tech I Semester Regular Examinations, Jan - 2015
THERMAL AND HYDRO PRIME MOVERS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Give examples of External combustion engines and internal combustion engines
   b) Draw the combined velocity triangle for the single stage impulse turbine. Explain the notations used in the velocity triangles
   c) What are the merits of Gas turbines over the steam turbines?
   d) Draw the operating characteristic curves of centrifugal pump and explain then in brief
   e) Draw the main characteristics of Pelton wheel and explain them in brief
   f) Explain about the duration curve (4M+4M+4M+3M+4M+3M)

Part –B

2. a) With a neat sketch explain Battery ignition system.
   b) A four-stroke gas engine has a bore of 20cm and stroke of 30 cm and runs at 300 rpm firing every cycle. If air-fuel ratio is 4:1 by volume and volumetric efficiency on NTP basis is 80%, determine the volume of gas used per minute. If the calorific value of gas is $8MJ/m^3$ at NTP and the brake thermal efficiency is 25% determine brake power of the engine. [8+8]

3. Derive expression for maximum blade efficiency in a single-stage impulse turbine [16]

4. a) Explain the Regenerative method applied to the gas turbine plant for improvement of the performance of plant with the help of P-V diagram and H-s diagram
   b) Describe with neat diagram a closed cycle gas turbine and also derive the expression of thermal efficiency of the closed cycle. State also its merits and demerits over open cycle gas turbine. [8+8]

5. a) Derive an expression of force exerted on a stationary curved plate when jet strikes the curved plate at the centre.
   b) Explain the working of volute casing of centrifugal pump with the help of neat sketch [8+8]

6. The jet of water coming out of nozzle strikes the buckets of a Pelton wheel which when stationary would deflect the jet through 165^0.The velocity of water at exit is 0.9 times at the inlet and the bucket speed is 0.45 times the jet speed. If the speed of the Pelton wheel is 300 rpm and the effective head is 150m, determine (i) Hydraulic efficiency (ii) Diameter of the Pelton wheel. Take coefficient of velocity C_v=0.98 [16]

7. a) Make a neat sketch of hydropower plant and explain working of each element in the plant.
   b) Differentiate between firm power and secondary power [8+8]
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Code No: RT21022 **R13** SET - 4

II B. Tech I Semester Regular Examinations, Jan - 2015
THERMAL AND HYDRO PRIME MOVERS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Define the following: i) bore ii) stroke iii) clearance volume iv) cubic capacity
b) Give the differences of Rankine cycle and Carnot cycle
c) List out the applications of the gas turbines
d) Explain about the multistage centrifugal pumps
e) Draw the main characteristic curves of Francis turbine and explain them in brief
f) Explain about the Utilization factor (4M+4M+3M+4M+4M+3M)

PART-B

2. a) With a neat sketch explain the magneto ignition system
b) A four-stroke, four cylinder gasoline engine has a bore of 60mm and a stroke of 100 mm. On test it develops a torque of 66.5 Nm when running at 3000 rpm. If the Clear acne volume in each cylinder is 60cc the relative efficiency with respect to brake Thermal efficiency is 0.5 and the calorific value of the fuel is 42MJ/kg, determine the fuel consumption in kg/h and the brake mean effective pressure. [8+8]

3. A single stage steam turbine is supplied with steam at 5 bar, 200^0C at the rate of 50 kg/min. It expands into condenser at a pressure of 0.2 bar. The blade speed is 400 m/s. The nozzles are inclined at an angle of 20^0 to the plane of wheel and the outlet blade angle is 30^0.Neglecting friction losses, determine the power developed, blade efficiency and stage efficiency. [8+8]

4. a) List out the differences between the open cycle gas turbine and closed cycle cycle gas Turbine
b) Derive an expression of air standard efficiency for the open cycle gas turbine with the neat Sketch and indicate the operations on P-V and T-s diagram [8+8]

5. a) Derive an expression of force exerted on a stationary curved plate when jet strikes the curved plate at one end tangentially when the plate is unsymmetrical.
b) Explain the working of single stage centrifugal pump with a neat sketch [8+8]

6. A pelton wheel has a mean bucket speed of 12m/s diameter and is supplied with water at the rate of $0.7m^3$/s under a head of 30m.If the buckets deflect the jet through an angle of 160^0,find the power and the efficiency of the turbine. [8+8]

7. a) Show that capacity factor is equal to the product of the load factor and the utilization factor
b) Differentiate between storage and pondage. Support your answer with a neat sketch [8+8]
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