BTS – III – 11.13 – 1162

B. Tech. Degree III Semester Examination November 2013

IT/CS/EC/CE/ME/SE/EB/EI/EE/FT 1301 ENGINEERING MATHEMATICS II

(2012 Scheme)

Time : 3 Hours | Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 x 5 = 40)

I. (a) Find the rank of the matrix.

$$\begin{bmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 4 & 5 & 6 \\ 3 & 4 & 5 & 6 & 7 \\ 4 & 5 & 6 & 7 & 8 \end{bmatrix}$$

(b) Check whether the vectors $X_1 = (1,1,2)$, $X_2 = (1,2,5)$ and $X_3 = (5,3,4)$ are linearly dependent or not.

(c) Find the Laplace transform of $t^2\, u(t-3)$

(d) Evaluate $\int_0^\infty \frac{e^{-t} - e^{-3t}}{t} dt$

(e) Find the Fourier sine and cosine integrals of $f(x) = e^{-kx}$, for $x > 0, k > 0$

(f) Express $f(x) = x$ as a Fourier cosine series in $0 < x < 2$

(g) Find the work done by the force $\overline{F} = 3xy\,\overline{i} - y^2\,\overline{j}$ when it moves a particle along the curve $y = 2x^2$ in the xy plane

(h) Find (i) $\nabla^2\left(\frac{1}{r}\right)$ where $r = |\overline{r}|$ and (ii) $\nabla\left(\frac{1}{r}\,\overline{r}\right)$

PART B

(4 x 15 = 60)

II. (a) Test for consistency of the following system of equations and solve them if consistent: (8)

$$x_1 + x_2 - x_3 = 0$$
$$2x_1 - x_2 + x_3 = 3$$
$$4x_1 + 2x_2 - 2x_3 = 2$$

(b) Verify Cayley Hamilton theorem and hence find A^4 (7)

$$A = \begin{bmatrix} 2 & -1 & 2 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$$

OR

(P.T.O.)

III. (a) For what values of k the equations $x+y+z=1, 2x+y+4z=k$, $4x+y+10z=k^2$ have a solution and solve them completely in each case. (10)

(b) Check whether $W=\{(a,b,o): a=b^2, a,b,\in R\}$ is a subspace or not (5)

IV. Find the inverse Laplace transform of

(i) $\dfrac{5S+3}{(S-1)(S^2+2S+5)}$ (5)

(ii) $\tan^{-1}\left(\dfrac{2}{S}\right)$ (5)

(iii) $\log\left(\dfrac{1+S}{S}\right)$ (5)

OR

V. (a) Solve the equation : $y^{11}-3y^{1}+2y=4t+e^{3t}$ when $y(0)=1$, $y^{1}(0)=-1$ (8)

(b) Apply convolution theorem to evaluate $L^{-1}\left\{\dfrac{1}{S(S^2+4)}\right\}$ (7)

VI. (a) Find the Fourier transform of e^{-x^2} (8)

(b) Solve the integral equation:

$$\int_0^\infty F(x)Cos\,px\,dx=\begin{cases}1-p & 0\le p\le 1\\ 0 & p>1\end{cases}$$ (7)

OR

VII. (a) Obtain the Fourier series for the function $f(x)=x^2, -\pi<x<\pi$. Hence show that (10)

(i) $1+\dfrac{1}{2^2}+\dfrac{1}{3^2}+.....=\dfrac{\pi^2}{6}$

(ii) $1-\dfrac{1}{2^2}+\dfrac{1}{3^2}-\dfrac{1}{4^2}+.....=\dfrac{\pi^2}{12}$

(iii) $1+\dfrac{1}{3^2}+\dfrac{1}{5^2}+.....=\dfrac{\pi^2}{8}$

(b) Find the finite Fourier Sine transform of $f(x)=2x\ in\ 0<x<4$ (5)

VIII. (a) Verify divergence theorem for $\overline{F}=x^2\overline{i}+z\overline{j}+yz\overline{k}$ over the cube formed by $x=\pm1, y=\pm1, z=\pm1$ (9)

(b) Prove that $\nabla.(\nabla x\,\overline{A})=0$ for any vector function $\overline{A}$ (6)

OR

IX. (a) Verify Stoke's theorem for $\overline{F}=(2x-y)\overline{i}-yz^2\overline{j}-y^2z\overline{k}$ where S is the upper half of the sphere $x^2+y^2+z^2=1$ and C is the circular boundary in the XY plane. (8)

(b) Show that $\overline{F}=(y^2+2xz^2)i+(2xy-z)\overline{j}+(2x^2z-y+2z)\overline{k}$ is irrotational and hence find its scalar potential. (7)

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BTS – III – 11.13 – 1173

B. Tech. Degree III Semester Examination November 2013

EE 1302 MATERIAL SCIENCE

(2012 Scheme)

Time : 3 Hours | Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 x 5 = 40)

I. (a) Explain free electron theory.

(b) Explain superconductivity and its practical applications.

(c) Explain dipolar relaxation.

(d) Explain loss tangent and its significance.

(e) Explain the properties of materials used in solar cells.

(f) Discuss on the materials used for switch contacts.

(g) Explain atomic absorption spectroscopy

(h) What is ferromagnetic resonance?

PART B

(4 x 15 = 60)

II. (a) Explain Fermi-Dirac distribution. (8)

(b) Explain briefly on the effect of temperature on electrical conductivity of metals. (7)

OR

III. Explain the fabrication process of p-n-p junction. (15)

IV. Explain (i) Electronic Polarization. (15)
(ii) Ionic Polarization.
(iii) Dipolar Polarization.

OR

V. (a) Explain the properties of following inorganic materials. (10)
(i) Mica (ii) Glass (iii) Porcelain (iv) Asbestos.

(b) Write a note on liquid insulators. (5)

VI. Explain (i) Cold mirror coating (15)
(ii) Heat mirror coating

OR

VII. Discuss on the various coatings for enhanced solar thermal energy collection. (15)

VIII. Explain the operation of an electron microscopy with neat diagram. (15)

OR

IX. Discuss on (i) Magnetic resonance (ii) Electron spin resonance. (15)

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BTS – III– 11.13 – 1184

B.Tech. Degree III Semester Examination November 2013

EE 1303 FLUID MECHANICS AND HEAT ENGINES

(2012 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 x 5 = 40)

I. (a) Explain how fluids are classified. Using stress-strain diagram explain the behaviour of fluids.

(b) Differentiate the following:
(i) steady and unsteady flow (ii) uniform and non uniform flow.

(c) What are the minor losses occurring in pipes? Discuss how they are determined.

(d) Write notes on kinematic similarity and dynamic similarity.

(e) Differentiate between impulse and reaction turbines.

(f) What is a draft tube? Why is it used in a reaction turbine?

(g) What is meant by priming? Explain its significance.

(h) Explain the multistage centrifugal pumps with the help of a diagram.

PART B

(4 x 15 = 60)

II. (a) Explain a U-tube differential manometer with the help of a diagram. (5)

(b) If for a two dimensional potential flow, the velocity potential is given by $\phi = x(2y-1)$ determine the velocity at the point P(4, 5). Determine also the value of stream function ψ at the point P also. (10)

OR

III. (a) Explain the principle of venturimeter with a neat sketch. Derive the expression for the rate of flow of fluid through it. (10)

(b) A horizontal venturimeter with inlet diameter 20cm and throat diameter 10cm is used to measure the flow of oil of specific gravity 0.8. The discharge of oil through venturimeter is 60 litres/sec. Find the reading of the oil mercury differential manometer. (5)

IV. (a) Derive Darcy-Weisbach equation for friction losses in pipes. State clearly the assumptions. (7)

(b) An oil of viscosity 0.1 Ns/m^2 and relative density 0.9 is flowing through a circular pipe of diameter 5cm and length 300m. The rate of flow of fluid through the pipe is 3.5 litres/sec. Find the pressure drop in a length of 300m and also the shear stress at the pipe wall. (8)

OR

V. (a) Define Reynolds number. Explain its significance. (5)

(b) The resisting force R of a supersonic plane during flight can be considered as dependent upon the length of the aircraft ℓ, velocity v, air viscosity μ, air density ρ and bulk modulus of air K. Using Buckingham's π-theorem, express the functional relationship between these variables and the resisting force. (10)

(P.T.O.)

VI. The penstock supplies water from a reservoir to the pelton wheel with a gross head of 500m. One third of the gross head is lost in friction in the penstock. The rate of flow of water through the nozzle fitted at the end of the penstock is $2.0m^3/sec$. The angle of deflection of the jet is 165°. Determine the power given by the water in the runner and also hydraulic efficiency of the pelton wheel. Take speed ratio = 0.45 and $C_v = 1.0$. (15)

OR

VII. A Francis turbine with an overall efficiency of 75% is required to produce a power of 15KW. It is working under a head of 7.62m. The peripheral velocity $= 0.26\sqrt{2gH}$ and the radial velocity of flow and inlet is $= 0.96\sqrt{2gH}$. The wheel runs at 150 rpm, and the hydraulic losses in the turbine are 22% of the available energy. Assuming radial discharge, determine: (15)

(i) The guide blade angle
(ii) The wheel vane angle at inlet
(iii) Diameter of the wheel at inlet
(iv) Width of the wheel at inlet

VIII. (a) Explain the use of air vessels in reciprocating pumps. (8)

(b) Explain the phenomenon of cavitation in pumps. How is it regulated? (7)

OR

IX. (a) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 rpm works against a total head of 40m. The velocity of flow through the impeller is constant and equal to 2.5m/s. The vanes are set back at an angle of 40° at outlet. If the outer diameter of the impeller is 50cm and width at outlet is 5cm, determine: (12)

(i) vane angle at inlet
(ii) work done by impeller on water per second
(iii) manometer efficiency

(b) Define an indicator diagram. (3)

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BTS – III – 11.13 – 1205

B.Tech. Degree III Semester Examination November 2013

EE 1304 CIRCUITS SIGNALS AND SYSTEMS I

(2012 Scheme)

Time : 3 Hours

Maximum Marks : 100

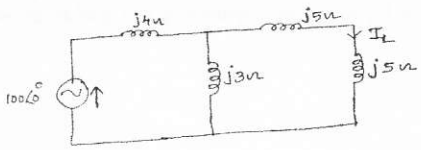
PART A

(Answer *ALL* questions)

$(8 \times 5 = 40)$

I. (a) Explain maximum power transfer theorem for ac circuits.

(b) For the circuit shown in figure, determine the load current by applying Thevenin's theorem.



(c) Define the following terms:
(i) Tie set matrix (ii) Incidence matrix

(d) Define coefficient of coupling. Derive an expression for it in terms of self and mutual inductances of the coupled coils.

(e) Explain the 2-wattmeter method of 3ϕ power measurement.

(f) Explain unbalanced 4 wire star connected load.

(g) Write short notes on amplitude and phase spectrum.

(h) Explain the properties of Fourier transforms.

PART B

$(4 \times 15 = 60)$

II. (a) State and explain reciprocity theorem. In figures (a) and (b) obtain V_o and establish the reciprocity theorem. (8)

Figure (a)

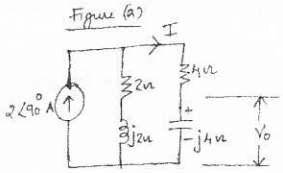
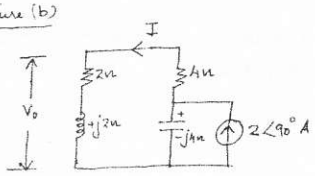
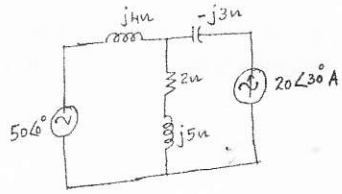


Figure (b)

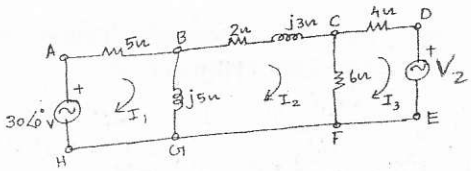


(b) Determine the voltage across $(2 + j5)\Omega$ impedance as shown in figure by using the super position theorem. (7)

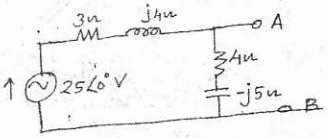


OR

III. (a) What is the value of V_2 such that the current in $(2 + j3)\Omega$ impedance is zero? (8)

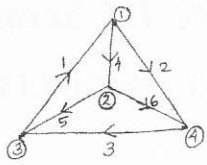


(b) For the circuit shown in figure, determine Norton's equivalent circuit between the O/P terminals AB. (7)



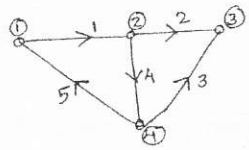
(P.T.O.)

IV. For the graph shown in figure, obtain the tie set matrix and network equilibrium equation in matrix form using KVL by selecting branches 4,5,6 as twigs. Also calculate loop currents and branch currents. (15)

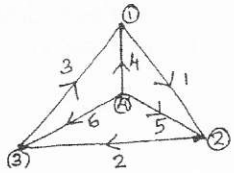


OR

V. (a) Develop the fundamental cut set matrix of the graph given below by taking branches 1,2 and 5 as twigs. (5)



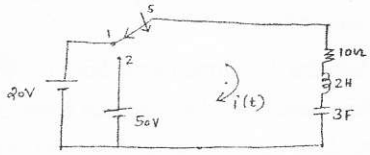
(b) Obtain the tie set matrix of the graph given below by selecting branches 4,5 and 6 as twigs. (5)



(c) Explain an ideal transformer (5)

VI. (a) Explain the transient response of an RL circuit having DC excitation. (8)

(b) In the network shown in figure, the switch is moved from position 1 to position 2 at t=0. The switch is in position 1 for a long time. Determine the current expression i(t). (7)



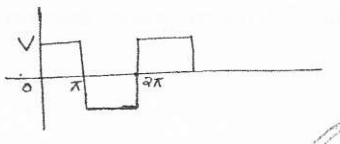
OR

VII. (a) Explain the transient response of an RC series circuit with sinusoidal excitation. (8)

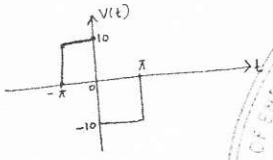
(b) An unbalanced 4 wire, star connected load has a balanced voltage of 400V, the loads are $Z_1 = (4 + j8)\Omega$, $Z_2 = (3 + j4)\Omega$, $z_3 = (15 + j20)\Omega$ (7)

Calculate (i) line currents (ii) current in the neutral wire and (iii) total power

VIII. (a) A square wave is shown in figure. Obtain the trigonometric Fourier series (8)

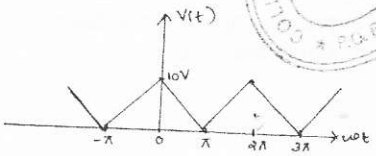


(b) Obtain the Fourier transform of the given waveform (7)

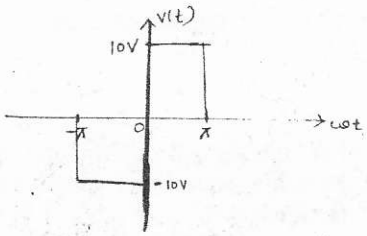


OR

IX. (a) Find the trigonometric Fourier series for the triangular waveform shown in figure. (8)



(b) Find the exponential Fourier series for the waveform shown in figure. (7)



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B.Tech. Degree III Semester Examination November 2013

EE 1305 ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS

(2012 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 × 5 = 40)

I. (a) Differentiate between accuracy and precision with examples.

(b) Prove that a PMMC instrument can be used only for measuring DC.

(c) What are instrument transformers? List out their advantages.

(d) What is creeping? Explain the remedy to eliminate creeping?

(e) Derive the condition for balance of a wheat stones bridge. What are its limitations?

(f) Explain the application of Hibberte magnetic standard.

(g) Explain voltage, frequency and phase measurement using CRO.

(h) Explain the laws of illumination?

PART B

(4 × 15 = 60)

II. (a) Explain the different types of error in measurement and their remedies? (10)

(b) A moving coil instrument gives a full scale deflection of 10mA when the potential difference across its terminals is 100mV. Calculate: (5)

(i) shunt resistance for a full scale deflection to 100A

(ii) the series resistance for full scale reading with 1000V.

OR

III. (a) Explain the principle of operation of dynamometer type instrument. Derive its torque equation. (10)

(b) Explain briefly different standards of measurement. (5)

IV. (a) Explain a suitable method to measure insulation resistance. (8)

(b) Explain the working of single phase power factor meter with diagram. (7)

OR

V. (a) Explain the working of single phase induction type energy meter with a neat figure. (10)

(b) A 230V single phase energy meter has a constant load current of 4A passing through it for 5 hours at unity power factor. If the meter makes 1104 revolutions during this period, what is the meter constant in revolutions per kwhr? (5)

VI. (a) Explain Murray loop test for localization of cable faults. (8)

(b) Explain the measurement of capacitance using Scherings bridge? (7)

OR

VII. (a) Explain the determination of hysterisis loop by method of reversals with a neat diagram. (10)

(b) Explain the working of flux meter with neat diagram. (5)

VIII. (a) Explain the principle of operation of cathode ray oscilloscope with neat diagram. (10)

(b) Explain dual beam oscilloscope with the help of block diagram. (5)

OR

IX. (a) Explain how hummer-brodhum photometer head is used to measure mean spherical candle power of a source of light. (10)

(b) Explain the terms: (5)

(i) Polar curves

(ii) Huminuous intensity

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