B.Tech. Degree III Semester Examination November 2013

IT/CS/EC/CE/ME/SE/EB/EI/EE/FT 301 ENGINEERING MATHEMATICS II

(2006 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

$(8 \times 5 = 40)$

I. (a) Examine the following system of equations for consistency

$$2x - 3y + 7z = 5$$
$$3x + y - 3z = 13$$
$$2x + 19y - 47z = 32$$

(b) Let $V_1 = (1,-1,0)$, $V_2 = (0,1,-1)$ and $V_3 = (0,0,1)$ be elements of R^3. Show that the set of vectors $\{V_1, V_2, V3\}$ is linearly independent.

(c) Obtain the Fourier series of $f(x) = |x|$ in $-\pi < x < \pi$, $f(x+2\pi) = f(x)$

(d) Find the Fourier cosine transform of

$$f(x) = \begin{cases} x & \text{for } 0 < x < 1 \\ 2 - x & \text{for } 1 < x < 2 \\ 0 & \text{for } x > 2 \end{cases}$$

(e) Find the Laplace transform of $\dfrac{\cos at - \cos bt}{t}$.

(f) Find the inverse Laplace transform of $\log\left(\dfrac{s+a}{s+b}\right)$

(g) Find a unit vector perpendicular to the surface $x^3 - xyz + z^3 = 1$ at $(1, 1, 1)$.

(h) Find the work done in moving a particle in the force field $F = 3x^2\vec{e} + (2xz - y)\vec{j} + z\vec{k}$ along the straight line from (0, 0, 0) to (2, 1, 3).

PART B

$(4 \times 15 = 60)$

II. (a) Using elementary transformation reduce the following matrix to its normal form. (7)

$$\begin{bmatrix} 1 & 2 & 0 & -1 \\ 3 & 4 & 1 & 2 \\ -2 & 3 & 2 & 5 \end{bmatrix}$$

(b) Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$. (8)

OR

III. (a) Using Cayley Hamilton theorem find A^{-1} if $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$. (8)

(b) $T : R^4 \to R^3$ (7)

$$T\begin{bmatrix} x \\ y \\ z \\ w \end{bmatrix} = \begin{bmatrix} x + y + w \\ z \\ y + 2w \end{bmatrix}.$$

Find $Ker(T)$ and $ran(T)$ and their dimensions.

(P.T.O.)

IV. (a) Obtain a half range cosine series for (8)

$$f(m) = kx \quad \text{for } 0 \le x \le \ell/2$$
$$= k(\ell - x) \quad \text{for } \ell/2 \le x \le \ell$$

Deduce the sum of the series $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots\ldots$

(b) Solve the integral equation (7)

$$\int_0^\infty f(x) \sin tx \, dx = 1 \quad 0 \le t < 1$$
$$2 \quad 1 \le t < 2$$
$$0 \quad t \ge 2$$

OR

V. (a) If $f(x) = |\cos x|$ expand $f(x)$ as a Fourier series in the interval $(-\pi, \pi)$. (8)

(b) Using the Fourier integral representation show that (7)

$$\int_0^\infty \frac{\omega \sin x\omega}{1+\omega^2} d\omega = \frac{\pi}{2} e^{-x} \quad (x > 0).$$

VI. (a) Find the Laplace transform of the periodic function and using this find the Laplace transform of the function (10)

$$f(t) = \sin \omega t \quad 0 < t < \pi/\omega$$
$$0 \quad \pi/\omega < t < \frac{2\pi}{\omega}$$

(b) Apply convolution theorem to evaluate $L^{-1}\left[\frac{1}{s(s^2+4)}\right]$. (5)

OR

VII. (a) Use Laplace transform method to solve $\frac{d^2x}{dt^2} + 9x = \cos 2t$ if $x(0) = 1$, $x(\pi/2) = -1$. (5)

(b) Find the inverse Laplace transform (10)

(i) $\frac{s+1}{s^2+4s+5}$

(ii) $\frac{s^2+6}{(s^2+1)(s^2+4)}$

VIII. (a) Prove that $curl(grad\,\phi) = 0$. (6)

(b) Apply Stoke's theorem to evaluate $\int_C ydx + zdy + xdz$ where C is the curve of intersection of $x^2 + y^2 + z^2 = a^2$ and $x + z = a$. (9)

OR

IX. (a) Verify divergence theorem for $F = 4xz\vec{e} - y^2\vec{j} + yzk$ over the cube bounded by $x = 0,\ x = 1,\ y = 0,\ y = 1,\ z = 0,\ z = 1$. (9)

(b) A vector field is given by $F = (x^2 - y^2 + x)\vec{e} - (2xy + y)\vec{j}$ show that the field is irrotational and find its scalar potential. (6)

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B.Tech. Degree III Semester Examination November 2013

EE 302 FLUID MECHANICS AND HEAT ENGINES

(2006 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 x 5 = 40)

I. (a) Differentiate between absolute pressure and gauge pressure.

(b) Define (i) circulation and (ii) Vorticity.

(c) List any four minor losses in pipes. Write the equations.

(d) Define any two dimensionless numbers in model analysis.

(e) How turbines are classified? Give examples.

(f) What is the purpose of fitting draft tube?

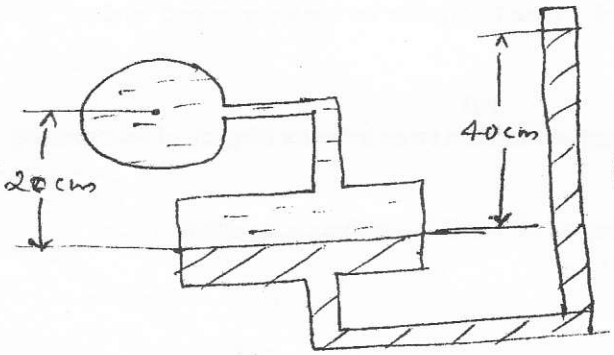
(g) What is cavitation? How can it be avoided?

(h) Indicate the main parts of a centrifugal pump on a rough sketch.

PART B

(4 x 15 = 60)

II. (a) A single column manometer is connected to a pipe carrying a liquid of specific gravity 0.9. Find the pressure in the pipe if the area of reservoir is 100 times the area of the manometer tube. (6)



(b) The velocity vector in a fluid is given by $V = 4x^3 i - 10x^2 yj + 2tk$. Find the velocity and acceleration of a fluid particle at (2, 1, 3) at time t = 1 units. (9)

OR

III. (a) Write Bernoulli's equation. What are its limitations? (3)

(b) An oil of specific gravity 0.8 is flowing through a venturimeter having inlet diameter 20cm and throat dia 10cm. The oil mercury differential manometer shows a reading of 25cm. Calculate the discharge of oil through the horizontal venturimeter. Take Cd = 0.98. (12)

IV. (a) The rate of flow of water through a horizontal pipe is 0.25 m^3/s. The diameter of the pipe is 200mm, and is suddenly enlarged to 400mm. The pressure intensity in the smaller pipe is 11.772 N/cm2 . Determine: (i) loss of head due to sudden enlargement (ii) Pressure intensity in the large pipe. (10)

(b) What is boundary layer? What is its significance in fluid flow analysis? (5)

OR

(P.T.O.)

V. (a) State Buckingham's π theorem. (3)

(b) The using π theorem, show that efficiency of a fan(η) can be expressed as (12)

$\eta = \phi\left[\frac{\mu}{D^2\omega\rho}, \frac{Q}{D^2\omega}\right]$ where μ, ρ, D, Q and ω are viscosity, density, diameter, discharge and angular velocity respectively.

VI. (a) A jet of water 2.5cm diameter, moving with 10m/s velocity strikes a hinged square plate of weight 98/N at the centre of the plate. Find angle through which the plate will swing. (5)

(b) A pelton wheel is having a mean bucket diameter of 1m and is running at 1000rpm. The net head on the pelton wheel is 700m. If the angle of deflection is 165° and discharge through nozzle is 0.1 m^3/s, find: (10)

(i) Power available at nozzle

(ii) Hydraulic efficiency of turbine

OR

VII. A turbine is to operate under a head of 25m at 200rpm. The discharge is $9m^3/s$. If the overall efficiency is 90% determine: (15)

(i) Specific speed of the machine

(ii) Power generated. Also, specify the turbine suitable for the given condition.

VIII. A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000rpm 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 impeller is 500mm and width at outlet is 50mm, determine: (15)
(i) Vane angle at inlet (ii) work done by impeller on water per second and
(iii) manometric efficiency

OR

IX. (a) Explain the effect of friction and acceleration on an indicator diagram of reciprocating pump. (9)

(b) Explain the importance of fitting an air vessel in a reciprocating pump. (6)

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BTS – III – 11.13 – 1182

B.Tech. Degree III Semester Examination November 2013

CE/EE 303 STRENGTH OF MATERIALS

(2006 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 × 5 = 40)

I. (a) Define normal and shear strains in a linearly elastic body.

(b) Define the term, 'strain energy'. Derive an expression for strain energy in an axially loaded bar.

(c) What are the equilibrium equation and compatibility condition for the analysis of a circular shaft fixed at both the ends and subjected to a uniform torque in between the supports?

(d) If the bending moment diagram of a beam is an isosceles triangle, draw possible shear force diagram and loading diagram.

(e) Derive the expression for curvature of a beam subjected to pure bending in terms of the bending moment, stating the assumption made.

(f) What are principal stresses? What is their significance in structural design?

(g) State the moment-area theorem to find the slope and deflection of beam.

(h) What are the limitations of applicability of Euler's buckling equation?

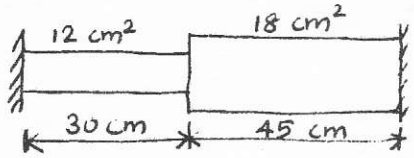
PART B

(4 × 15 = 60)

II. A rigid bar is supported by three rods, the outer ones of steel and the central one of copper. The cross-sectional area of each steel rod is 300 mm^2 and that of the copper rod is 1000 mm^2. The three rods are equally spaced and loads of 50kN each are applied midway between the rods. Determine the forces in each of the vertical bars if the rigid bar remains horizontal after the loads have been applied. Neglect the weight of the rigid bar. Take Es=205 kN/mm^2 and Ec=110kN/mm^2.

OR

III. A steel rod 75cm long consists of two cross-sections, as shown in the figure. If the supports are unyielding and initial temperature is 10°C, calculate the maximum stress induced in the rod with an increase of temperature to 40°C. Take E = 200 GPa and $\alpha = 12 \times 10^{-6}$ per degree Celsius.

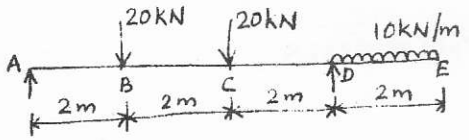


IV. A shaft has to transmit a torque of 16 kNm. Compare the weights of the shaft per unit length when it has a solid circular section and when it is a hollow circular tube with an inner diameter that is 80% of the outer diameter. Assume that the allowable shear stress is 70 MPa.

OR

(P.T.O)

V. Draw the shear force diagram and bending moment diagram of the beam, shown below. Mark the ordinates at salient points in the diagrams and locate the point of contraflexure, if any.



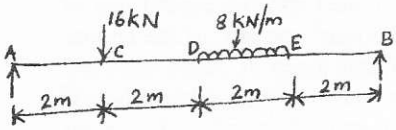
VI. A steel I-section has an overall depth of 200mm and a flange width of 150mm. The thickness of the flange and web are 15mm and 10mm respectively. If the maximum permissible bending stress is 100 N/mm^2, determine the uniformly distributed load it can carry over simply supported span of 6m. Draw the distribution of shear stress across the cross-section at the supports of the beam.

OR

VII. The rectangular stress components acting at a point in a structure are given as: $\sigma_{xx} = 20\text{MPa}$, $\sigma_{yy} = 40\text{MPa}$ and $\tau_{xy} = 10\text{MPa}$. Determine,

(i) the principal stresses and principal planes,
(ii) the maximum shear stress and its plane,
(iii) the normal stress in the maximum shear stress plane
(iv) the normal and shear stresses in a plane whose normal is inclined to the x-axis by 30°

VIII. Determine the slopes at A and B and deflections at C, D and E of the simply supported beam, shown below:
E = 2 x 10^5 MPa, I = 8 x 10^{6}mm^4.



OR

IX. (a) Derive Euler's formula for a slender column with both ends, hinged.

(b) Calculate the crippling stress using Euler's formula for a column, both ends hinged, 180 cm long and with a tubular cross-section, 6.35cm outside diameter and wall thickness of 0.32cm. E = 200 GPa.

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BTS – III – 11.13 –1204

B.Tech. Degree III Semester Examination November 2013

EE 304 ELECTRIC CIRCUIT THEORY

(2006 Scheme)

Time : 3 Hours

Maximum Marks : 100

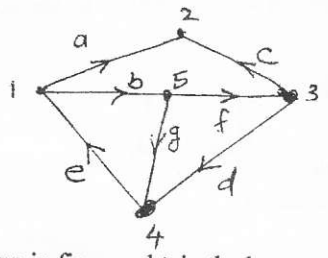
PART A

(Answer *ALL* questions)

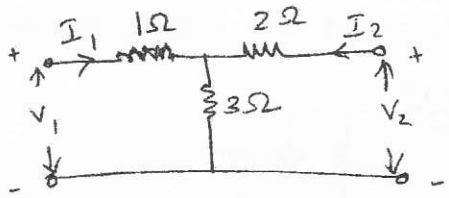
$(8 \times 5 = 40)$

I. (a) State and explain Norton's theorem as applied to ac networks with an example.

(b) For the graph shown in figure, draw all possible trees and obtain the complete incidence matrix.



(c) For the network shown in figure, obtain the h parameters.



(d) Prove that, for a coupled coil $M = k\sqrt{L_1 L_2}$.

(e) The input power to a 3 phase load is 5KW at 0.8pf. Two wattmeters are connected to measure the power. Find the individual readings of the wattmeters.

(f) Obtain the expression for changing current of a capacitor C when it is subjected to a dc voltage V. Also draw its response curve.

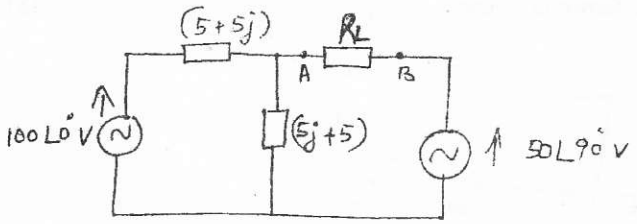
(g) For a constant k low pass filter, determine the pass band graphically.

(h) Determine the Fourier transform of the general impulse function $x_{(t)} = A\delta(t)$.

PART B

$(4 \times 15 = 60)$

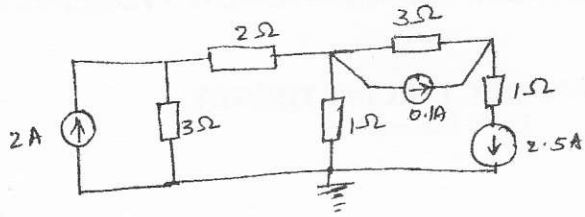
II. Determine the maximum power transferred to the load connected across AB in figure. (15)



OR

(P.T.O.)

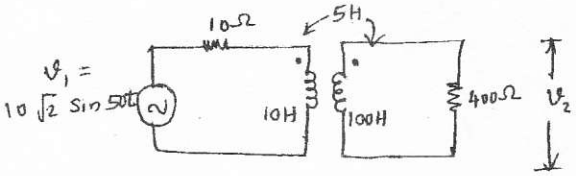
III. Find the current through 2Ω resistor of the circuit shown in figure using node analysis. (15)



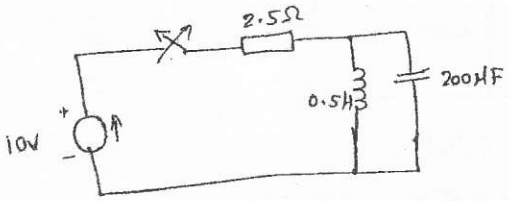
IV. For a symmetrical T network with resistance values 2Ω, 1Ω and 2Ω, compute the Z-parameters. Draw the Z-parameter equivalent circuit and hence calculate the current through a 4Ω resistance load connected across the output port with the input port excited by a dc voltage source of 30V and interval resistance 1Ω. Also compute the input and output impedances. (15)

OR

V. For the circuit shown in figure, find the ratio of output voltage to the source voltage (V_2/V_1). (15)



VI. At t = 0, the switch is opened in the network shown in figure. Find the current through the inductor. (15)



OR

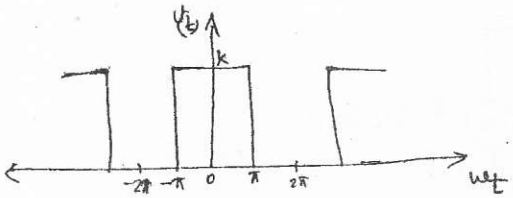
VII. A symmetrical 3ϕ, 100V, 3 wire supply feeds an unbalanced star connected load with impedances as $Z_R = 5\angle 0^\circ\,\Omega$, $Z_y = 2\angle 90^\circ\,\Omega$ and $Z_B = 4\angle^{-}90^\circ\,\Omega$. Find the line currents and voltage across the impedances. (15)

VIII. Find the first and second foster networks whose driving point impedance is given by (15)

$$Z_{(s)} = \frac{5\left(s^2+4\right)\left(s^2+25\right)}{s\left(s^2+16\right)}$$

OR

IX. (a) Find the Fourier series of the function shown in figure. (8)



(b) Design an m-derived low pass filter (T-section) having cut-off frequency of 1KHz, design impedance of 400Ω, and the resonant frequency 1100 Hz. (7)

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BTS – III – 11.13 – 1220

B.Tech. Degree III Semester Examination November 2013

EE 305 ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS

(2006 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

$(8 \times 5 = 40)$

I. (a) Explain precision, sensitivity, relative error and resolution of measuring instruments.
(b) Describe the various errors and compensation in pmmc instruments.
(c) What is creeping and explain the remedy to eliminate the creeping.
(d) Describe the instrument transformers and list out their advantages.
(e) Explain maxwell's inductance bridge for the measurement of unknown resistance.
(f) Explain the step by step method for the determination of BH curve of a specimen.
(g) Explain the laws of illumination.
(h) A 250V lamp has a total flux of 3000 lumens and takes a current of 0.8A. Calculate : (i) lumens/watts (ii) mscp per watt.

PART B

$(4 \times 15 = 60)$

II. (a) Explain errors in measurement system and their remedies. (10)
(b) A moving coil meter has a resistance of 5 Ω and given full scale deflection with 25 mA. How can it be used to measure a voltage upto 300V? (5)

OR

III. (a) Derive the general torque equation of a moving iron instrument. (8)
(b) Explain shunts and multipliers used in dc instruments. (7)

IV. (a) Explain the method of measuring earth resistance using earth megger. (8)
(b) Describe the various errors in electro dynamometer type wattmeter. How are they compensated? (7)

OR

V. (a) Explain the construction and working of weston frequency meter. (8)
(b) Explain the construction and operation of a single phase induction type energy meter. (7)

VI. (a) Explain Kelvin double bridge method of measurement of low resistance with neat diagram. (8)
(b) Explain the construction and working of a flux meter. (7)

OR

VII. What are the different faults occurring in under ground cables and explain any one test to localize any one fault. (15)

VIII. (a) A filament lamp of 500W is suspended at a height of 5 meters above working plane and gives uniform illumination over an area of 8m diameter. Assume efficiency of reflector as 60%. Determine the illumination on the working plane efficiency of lamp is 0.9 watt/C.P. (8)
(b) Explain dual beam oscilloscope with the help of block diagram. (7)

OR

IX. (a) Explain any one method for the measurement of mean spherical candle power of a source of light. (10)
(b) Describe polar curves of illumination. (5)

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B.Tech. Degree III Semester Examination November 2013

CS/EB/EE 306 ELECTRONIC DEVICES AND CIRCUITS

(2006 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 × 5 = 40)

I. (a) Explain the process of avalanche breakdown in a PN junction diode. How does it differ from zener breakdown?

(b) Explain the working of a voltage multiplier.

(c) Compare BJT and FET.

(d) Define h parameter. Draw the h parameter equivalent of a transistor in CE configuration.

(e) Why are class AB power amplifiers used? Compare its performance with class C amplifier.

(f) Why is heat sink used? Discuss its design considerations.

(g) Explain the working of combinational clipper with the help of transfer characteristics.

(h) Draw and explain a simple transistor sweep circuit.

PART B

(4 × 15 = 60)

II. (a) Explain the working of a bridge rectifier with the help of neat sketches. Derive the expression for nipple factor. (10)

(b) Compare the different rectifier circuits with the help of tabular column. (5)

OR

III. (a) Draw the structure of a PIN diode and explain its working. (7)

(b) Explain the working of enhancement mode MOSFET with the help of characteristic curves. (8)

IV. (a) List the different types of biasing techniques used for transistors. Which is the best among these? Justify your answer. (12)

(b) What do you understand by AC load line? (3)

OR

V. (a) Draw the circuit diagram of CE RC coupled amplifier. Draw and explain its frequency response highlighting the effect of bypass and coupling capacitor. What is the significance of 3 db bandwidth? (10)

(b) Explain how FET can be used as a voltage variable resistor. (5)

VI. (a) Explain the working of complementary symmetry power amplifier with suitable diagram. (9)

(b) Explain the concept of negative and positive feed back. What is the necessary and sufficient condition for oscillation? (6)

OR

VII. (a) Explain the working of a RC phase shift oscillator with a circuit diagram. (8)

(b) Draw and explain a crystal oscillator circuit. (7)

VIII. (a) What is a differentiator? What is an integrator? Compare them with the help of circuit diagram and waveforms. Mention their applications. (10)

(b) Explain a negative clamper circuit. (5)

OR

IX. (a) Draw the circuit diagram of a monostable multivibrator. Explain its operations with the help of relevant waveforms. (9)

(b) Draw and explain bootstrap sweep circuit. (6)

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