G 6741 (Pages : 3) Reg. No.....EEE.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2011

Third Semester

Branch : Civil, Mechanical, Electrical and Electronics, Polymer Electronics and Communication, Applied Electronics and Instrumentation, Instrumentation and Control Electronics and Instrumentation, Automobile Engineering, Aeronautical Engineering

ENGINEERING MATHEMATICS—II (CMEPLANSUF)

(2002 admission onwards—Supplementary)

Time : Three Hours Maximum : 100 Marks

Answer any **one** *full question from each module.*
Each full question carries 20 marks.

Module 1

1. (a) Find a unit vector normal to the surface $z = x^2 + y^2$ at the point (1, 3, 4). (5 marks)

(b) Find the directional derivative of the function $\phi = xy + yz + zx$ at (2, 1, 3) along $3\vec{i} + 4\vec{j} + 5\vec{k}$. (6 marks)

(c) Prove that curl curl $\vec{F}$ = grad div $\vec{F} - \nabla^2\vec{F}$ and hence deduce that curl curl curl curl $\vec{F} = \nabla^4 \vec{F}$, if $\vec{F}$ is solenoidal. (9 marks)

Or

(d) If $\phi = \phi(r)$ show that div $\{\phi(r)\vec{r}\} = 3\phi(r) + r\phi'(r)$ Hence evaluate div $(\phi(r)\hat{r})$. (8 marks)

(e) Find the constants a and b so that $\vec{F} = (axy + x^3)\hat{i} + (3x^2 - z)\hat{j} + (bxz^2 - y)\hat{k}$ is irrotational and find ϕ such that $\vec{F} = \nabla\phi$. (7 marks)

(f) Define the gradient of a scalar function. Show that $\nabla\phi$ is a vector normal to the surface $\phi(x, y, z) = c$. (5 marks)

Module 2

2. (a) Find the circulation $\vec{F}$ around the closed curve C, where $\vec{F} = y\vec{i} + z\vec{j} + x\vec{k}$ and C : curve $x^2 + y^2 = 1, z = 0$. (5 marks)

(b) State Gauss theorem and use it to evaluate $\iint_S \vec{F} \cdot \hat{n} ds$ where $\vec{F} = x^2\hat{i} + y\hat{j} + z\hat{k}$ and S is the surface of the cube bounded by the planes $x = 0, x = a, y = 0, y = a$ and $z = 0, z = a$. (8 marks)

(c) Find the work done in moving a particle once round a circle (in the xy plane) which has centre at the origin and radius = 2. Given that the force field is $\vec{F} = (2x - y + 2z)\hat{i} + (x + y - z^2)\hat{j} + (3x - 2y - 5z)\hat{k}$. (7 marks)

Turn over

(c) Employ Stirling's formula to compute $u_{12.2}$ from the table : ($u_x = 1 + \log \sin x$) :

x° :	10	11	12	13	14
$10^5 u_x$:	23967	28060	31755	35201	38638

(8 marks)

Or

(d) Given the values :

x :	5	7	11	13	17
$f(x)$:	150	392	1452	2388	5201

Evaluate $f(9)$, using Lagrange's and Newton's divided difference formula.

(10 marks)

(e) Given

θ :	0°	5°	10°	15°	20°	25°	30°
$\tan\theta$:	0	0.0875	0.1763	0.2679	0.364	0.4663	0.5774

Using Stirling's formula, show that $\tan 16^\circ = 0.2867$.

(10 marks)

Module 5

5. (a) Evaluate $\int_0^1 \frac{dx}{1+x}$ with $h = 0.25$ and $h = 0.5$ using trapezoidal and Simpson's 1/3rd rule and compare the values.

(10 marks)

(b) A rocket is launched from the ground. Its acceleration is registered during the first 80 seconds and is given in the table below. Using Simpson's 1/3 rd rule, find the velocity of the rocket at $t = 80$ seconds.

t(sec) :	0	10	20	30	40	50	60	70	80
f(cm/sec^2) :	30	31.63	33.34	35.47	37.75	40.33	43.25	46.69	50.67

(10 marks)

Or

(c) A river is 80 ft wide. The depth d in feet at a distance x ft. From one bank is given by the following table :

x :	0	10	20	30	40	50	60	70	80
d :	0	4	7	9	12	15	14	8	3

Find approximately the area of the cross-section.

(10 marks)

(d) Evaluate $\int_0^4 e^x dx$ Simpson's rule, given that $e = 2.72$, $e^2 = 7.39$, $e^3 = 20.09$, $e^4 = 54.6$ and compare it with the actual value.

(10 marks)

(5 × 20 = 100 marks)

(d) Using Green's theorem, evaluate $\int_C (x^2 + xy)\,dx + (x^2 - y^2)\,dy$ where C is the square formed by the lines $x = \pm 1$, $y = \pm 1$.

(10 marks)

(e) Verify divergence theorem for $\vec{F} = (x^2 - y^2)\,\hat{i} + (y^2 - 2x)\hat{j} + (z^2 - xy)\hat{k}$ taken over the rectangular parallelopiped $0 \le x \le a, 0 \le y \le b, 0 \le z \le c$.

(10 marks)

Module 3

3. (a) Construct the analytic function whose real part is $r^2 \cos 2\theta$. (5 marks)

(b) (i) Does the function $f(z) = \begin{cases} e^{-(1/z^4)}, & z \neq 0 \\ 0, & z = 0 \end{cases}$ satisfy the Cauchy-Riemann equations at $z = 0$? (5 marks)

(ii) For what values of z is $f(z)$ analytic ? (5 marks)

(iii) Show that f is continuous at $z = 0$. (5 marks)

Or

(c) If $\phi + i\psi$ represents the complex potential of an electrostatic field where $\psi = (x^2 - y^2) + \frac{x}{x^2 + y^2}$, find the complex potential as a function of the complex variable z and hence determine ϕ.

(8 marks)

(d) Find the bilinear transformation which maps the points $z = 1, i, -1$ into $w = 0, 1, \infty$.

(7 marks)

(e) If $f(z) = u + iv$ is analytic, show that $u = c_1$ and $v = c_2$ cut orthogonally.

(5 marks)

Module 4

4. (a) Prove that $e^x = \left[\frac{\Delta^2}{E}\right] e^x \cdot \frac{Ee^x}{\Delta^2 e^x}$, the interval of differencing being h. (5 marks)

(b) Prove the identify :

$$u_1 x + u_2 x^2 + u_3 x^3 + \ldots = \frac{x}{1-x} u_1 + \frac{x^2}{(1-x)^2} \Delta u_1 + \frac{x^2}{(1-x)^3} \Delta^2 u_1 .$$

(7 marks)

Module 5

15. (a) For the network shown in Fig. 6, draw the graph of the network and obtain the tie-set schedule considering J_1, J_2 and J_5 as tree branches. Calculate all the branch currents.

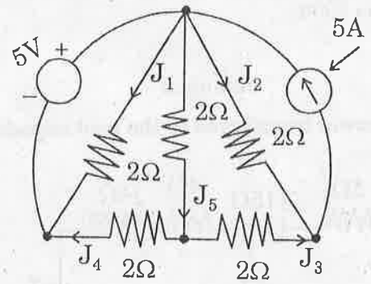


Fig. 6

Or

(b) Describe the features of MATLAB. With a simple circuit example, show how MATLAB can be used for its analysis.

(5 × 12 = 60 marks)

G 6752 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2011

Third Semester

Branch : Electrical and Electronics Engineering

ELECTRIC CIRCUIT THEORY (E)

(2002 admission onwards—Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions briefly. Each question carries* 4 *marks.*

1. Differentiate between current and voltage sources. Give practical examples for each.
2. Give a general description of performing mesh analysis. What are the limitations of the method.
3. List the properties of an ideal transformer and its parameters.
4. Two similar coupled coils of resistance 10 Ω and self inductance 1H are in series. This is in series with a 220 μF capacitor. A 220 V, 50 Hz source energises the circuit. Draw the circuit, place the dot markings and calculate the coupling coefficient so that the circuit behaves like a pure resistor.
5. Three similar resistors form a 3 phase load. If one resistor is removed, find the reduction in power, if the connection is : (i) star ; (ii) delta.
6. What is maximum power transfer principle ? What is its practical importance ? Find the power transfer efficiency corresponding to maximum transfer.
7. Obtain the relationship between line and phase voltages and currents in a balance star system.
8. Explain how 3-phase voltage is generated.
9. Explain how tie-set matrix is formed.
10. Relate an incidence matrix with cut-set matrix.

(10 × 4 = 40 marks)

Part B

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. (a) (i) Obtain the drop across the 1 Ω resistor in the circuit shown in Fig. 1 when the control current i_c in the dependent current source is – 1A. Assume $\alpha = 4$ and the magnitude of current in the constant current source as 1 A.

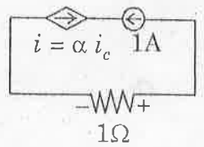


Fig. 1

(6 marks)

(ii) The voltage across an inductor is $v(t) = 0$ for $t \leq 0$. $v(t) = 20te^{-2t}$ $t \geq 0$ for $t \geq 0$. Obtain the expression for the current in the inductor.

(6 marks)

Or

(b) (i) For the cicruit in Fig. 2, calculate the current through the 10Ω resistance using loop analysis.

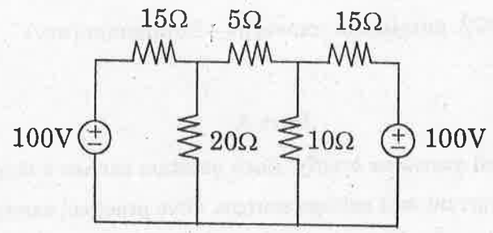


Fig. 2

(6 marks)

(ii) Find the nodal voltage by node voltage analysis method in the network shown in Fig 3.

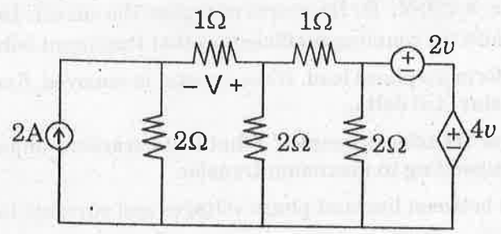


Fig. 3

(6 marks)

Module 2

12. (a) (i) Two coils having 1000 turns and 1400 turns respectively are placed close to each other such that, 70% of the flux produced by one coil links the other. If a current of 10 A, flowing in the first coil, produces a flux of 0.5 mWb, find the inductance of the second coil.

(6 marks)

(ii) The inductance matrix for the circuit of a three series connected coupled coils is given. Find the inductances and indicate the dots for the coils.

$$L = \begin{bmatrix} 10 & -6 & 1 \\ -2 & 5 & -6 \\ 1 & -4 & 4 \end{bmatrix}.$$

(6 marks)

Or

(b) (i) Explain the dot convention for coils. (4 marks)

(ii) Two coils have 100 and 1000 turns respectively and wound on a closed iron circuit of sections 50 cm^2 and mean length 100 cm. Calculate the self inductance of each coil. Also determine the mutual inductance and coefficient of coupling between the coils if the permeability of iron is 1000.

(8 marks)

Module 3

13. (a) (i) Find the maximum power transferred to the load impedance Z_L in the circuit in fig. 4.

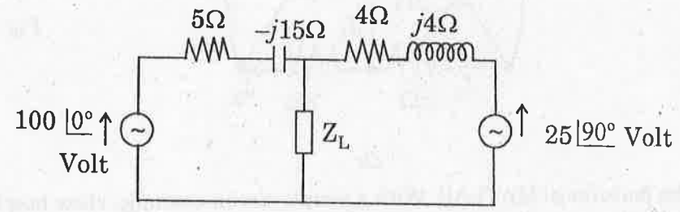


Fig. 4

(8 marks)

(ii) State and explain Tellegen's theorem using a suitable example. (4 marks)

Or

(b) Calculate the current in 10Ω resistor using Thevenin's theorem for the circuit in Fig. 5. Verify your result using Norton's theorem.

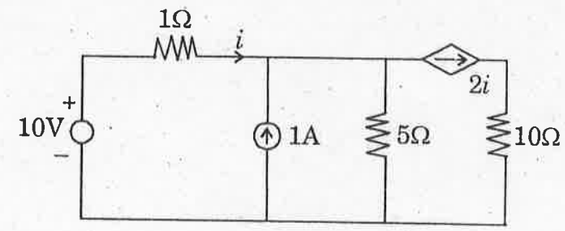


Fig. 5

(12 marks)

Module 4

14. (a) A three-phase delta-connected RYB system with an effective voltage 440 V has its load with impedances $2 + j3\Omega$. Calculate the (i) phase currents ; (ii) line currents ; and (iii) power in each phase.

Or

(b) A three-phase, three-wire unbalanced load is star-connected. The phase voltages of two of the arms are $V_R = 200\,|\underline{-10°}$, $V_Y = 150\,|\underline{100°}$. Calculate the voltage between star point of the load and the supply neutral.

G 6760

(Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2011

Third Semester

Branch—Electrical and Electronics Engineering

ELECTROMAGNETIC THEORY (E)

(2002 Admissions onwards —Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions briefly.*
Each question carries 4 marks.

1. State all the conditions for which
   (a) $A \cdot B = 0$ (b) $A \times B = 0$
2. Explain the physical significance of the term :
   (a) Divergence of a vector field. (b) Curl of a vector field.
3. Define the term potential and establish the gradient relationship between potential and electric field intensity.
4. Explain the concept of energy density, considering a parallel plate capacitor.
5. Determine the capacitance between coaxial cylinders.
6. Explain horizontal and vertical polarization.
7. State Ampere's law in integral and differential form as used in magnetic field.
8. Explain the concept of (a) scalar magnetic potential and (b) magnetic vector potential.
9. Explain the significance of displacement current.
10. State and explain the significance of Poynting theorem.

(10 × 4 = 40 marks)

Part B

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module I

11. (a) (i) Two points are given as P (2, –1, –3) and Q (1,3,4). Give the vector that extends from P to Q in (1) Cartesian coordinates ; (2) cylindrical coordinates ; and spherical coordinates.
    (ii) A point chanre $Q_1 = 300\mu c$ located at (1, –1, –3) m experiences a fore $F_1 = 8I_x - 8 I_y + 4I_z$ N, due to a paint charge Q_2 at (3, –3, –2) m. Determine Q_2

Or

Turn over

(b) Determine the charge density due to each of the following electric flux densities :

(i) $D = 6xy\, I_x + 4x^2\, I_y$

(i) $D = r\sin\phi\, I_r + 2r\cos\phi\, I_\phi + 3z^2\, I_z$

Module 2

12. (a) Two concentric conducting spheres of radius a = 6 cm and b = 14 cm have equal and opposite charges 10^{-7} coulomb on the inner and -10^{-7} coloumb on the outer. The region is filled with free space. Find (i) the maximum value of E between the spheres (ii) the total energy stored.

Or

(b) (i) Describe the variation of electric field intensity and potential due to spherical volume distribution of charge.

(8 marks)

(ii) A uniform line charge ρ = 2 nC/m lies in the z = 0 plane parallel to the x-axis at y = 3m. Find the potential difference V_{AB} for the points A = (2, 0, 6) and B (0,0,0) m.

(4 marks)

Module 3

13. (a) (i) An electric field strength 1.2 V/m is entering a dielectric medium of ϵ_R= 4 from air. The orientation of $\overline{E}$ in air is 60° with respect to boundary. Determine the orientation of $\overline{E}$ in the dielectric and its strength in the dielectric.

(7 marks)

(ii) Calculate the capacitance of a parallel plate capacitor, if the plates are of area 1.5 m^2, the distance between the plates is 2mm, potential gradient is 10^5 v/m and ρ_s as 2 $\mu C/m^2$.

(5 marks)

Or

(b) (i) An air capacitor consists of two parallel square plates 50 cm side is charged to a voltage of 180 V, with plate separation of 1 mm. Calculate the work done in widening the separation of the plates to 1 cm. Assume perfect insulation.

(6 marks)

(ii) Find the angle by which the direction of E charges as it crosses the boundary between two dielectrics with dielectric constants 4 and 5. The incident angle is 50° with the normal

(6 marks)

Module 4

14 (a) (i) Find the flux crossing the plane surface defined by $0.5 \le r \le 2$m and $0 \le z \le 4$ m if

$$\overline{B} = \left(\frac{4}{r}\overline{a}_\phi\right) T.$$

(6 marks)

(ii) A circuit carrying a direct current 5 A forms a regular hexagon inscribed in a circle of radius 1m. Calculate the magnetic flux density at the centre of the hexagon. Assume the medium to be free space.

(6 marks)

Or

(b) (i) Find the magnetic flux density at a point on the axis of a circular loop of radius γ, carrying a current I.

(ii) A toroidal core is composed of a material with μ_r = 25. The surface forming toroid are z = 0, z = 0.025 m, r_1= 0.025 m, r_2 = 0.04 m. The core is wound symmetrically with 12000 turns of wire such that $\overline{H}$ is in the $\overline{a}_\phi$ direction. Find inductance.

Module 5

15. (a) Derive Maxwell's curl equations from Ampere's law and Faraday's law. Express the equation in phasor form for time harmonic fields.

Or

(b) (i) Write the expression for plane electromagnetic waves propagating in a dielectric media in a direction $\overline{r}$ with respect to origin (0,0,0).

(4 marks)

(ii) A 10 GHz uniform plane wave travels in a lossless unbounded medium having $\mu = \mu_0$, $\epsilon = 4\epsilon_0$. Find (1) velocity of propagation (2) wavelength (3) intrinsic impedance (4) attenuation constant.

(8 marks)

(5 × 12 = 60 marks)

G 6767 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2011

Third Semester

Branch : Electrical and Electronics Engineering

ELECTRICAL AND ELECTRONIC MEASUREMENTS (E)

(2002 admission onwards—Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions briefly.*
Each question carries 4 *marks.*

1. List the precautions to be taken in magnetic measurements.
2. Name the four intrinsic constants of a galvanometer.
3. What are the applications of a.c. potentiometer ?
4. What is the condition to get maximum sensitivity for a wheatstone bridge ?
5. Draw the diagram of Maxwell's inductance bridge and write the expression for unknown inductance.
6. State the applications of Wien bridge ?
7. Explain the use of instrument transformers.
8. What are systematic errors ? How they can be located ?
9. Write down the inverse square law and cosine law as applicable to illumination practice.
10. What are various types of thermocouples ? Explain any one type in detail.

(10 × 4 = 40 marks)

Part B

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. (a) (i) Explain the calibration of a ballistic galvanometer. (6 marks)

(ii) A ballistic galvanometer gives a first maximum deflection of 50° for a discharge of 900 μC. Find the quantity of electricity which when discharged through this galvanometer gives rise to spot deflection of 8 divisions on a millimeter circular scale 1 meter away. (6 marks)

Or

(b) (i) List the differences between fluxmeter and a ballistic galvanometer. (4 marks)

(ii) A fluxmeter is connected to a search coil having 600 turns and a mean area of 600 mm^2. The search coil is placed at a centre of a solenoid 1 meter long, wound with 900 turns. When a current of 6A is reversed, there is a deflection of 30 scale divisions. Calculate the calibration in flux linkages per scale division.

(8 marks)

Module 2

12. (a) List the application of d.c. potentiometer. Explain how it can be used for calibration of :

(i) voltmeter ; (ii) ammeter ; (iii) wattmeter.

Or

(b) (i) Explain any one method of measuring earth resistance. (6 marks)

(ii) A low resistance was measured by Kelvin double bridge. At balance the components are found as follows :

Standard resistor = 100.03 micro ohm, inner ratio arms = 100.31 Ω and 200 Ω , resistance of link connecting the standard and unknown resistance = 700 micro ohm. Calculate the unknown resistance.

(6 marks)

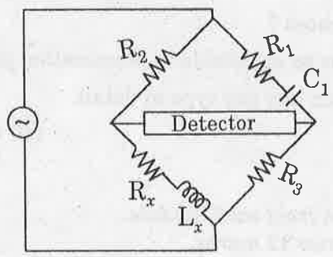
Module 3

12. (a) With a neat circuit diagram, derive the expression for the determination of unknown inductance using Anderson bridge. Draw the phasor diagram. Comment on the merits and limitations.

Or

(b) (i) Describe how Wien bridge can be used for the measurement of frequency. (6 marks)

(ii)



Find the series equivalent inductance and resistance of the network that causes an opposite angle (Hay bridge) to null the following bridge arms in the above figure w = 3000 rad/s, R_2 = 9k Ω , R_1 = 1.8k Ω , C_1 = 0.9 μF, R_3 = 0.9 k Ω .

(6 marks)

Module 4

14. (a) (i) Derive an expression for transformation ratio of C.T. (6 marks)

(ii) List and explain different errors in indicating instruments, with suitable examples.

(6 marks)

Or

(b) (i) Show the connections in a single phase a.c. power measurement with a CT, PT and a wattmeter. Explain the effect of phase angle error of CT and PT on this measurement.

(8 marks)

(ii) Differentiate between systematic error and random error encountered in electrical measurements.

(4 marks)

Module 5

15. (a) What is a polar curve ? How it is useful ? Explain Rousseau's construction for calculating M.S.C.P. of a lamp.

Or

(b) Explain the laws of thermo electric circuits. Describe the constructional details, working principle of any one type of thermocouple instrument.

[5 × 12 = 60 marks]

G 6774 (Pages 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2011

Third Semester

Branch : Electrical and Electronics Engineering

POWER GENERATION AND DISTRIBUTION (E)

(2002 Admissions onwards—Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. Define and explain the importance of load factor and diversity factor.
2. What is tariff ? Discuss the objectives of the tariff.
3. Briefly explain the interconnected system of distribution. Mention its merits and demerits.
4. Why capacitors are used in LT lines ? Explain its size selection.
5. Briefly explain the rules for generation of electrical energy.
6. What is synchronous condenser ? Explain its application.
7. Derive an expression for capacitance of a single core cable.
8. Explain Varley loop test for locating short circuit faults in underground cables.
9. Explain the basic principle of electrostatic generator.
10. How is the wave front and wave tail times controlled in impulse generator circuits ?

(10 × 4 = 40 marks)

Part B

11. (a) What is load curve ? Explain its importance in power system. (6 marks)

(b) The annual load duration curve of a certain power station can be considered as a straight line from 20 MW to 4 MW. To meet this load three turbine-generator units, two rated at 10 MW each and one rated at 5 MW are installed. Determine (i) installed capacity ; (ii) plant factor ; (iii) units generated per annum ; (iv) ; load factor and ; (v) utilization factor.

(6 marks)

Or

(c) What is depreciation ? Explain the sinking fund method for determining the depreciation.

(7 marks)

Turn over

(d) A hydro electric plant costs Rs.3,000 per kW of installed capacity. The total annual charges consist of 5% as interest ; deprecation at 2%, operation and maintenance at 2% and insurance, rent etc. 1.5%. Determine a suitable two part tariff if the losses in transmission and distribution are 12.5% and diversity of load is 1.25. Assume the maximum demand on the station is 80% of the capacity and annual load factor is 40%. What is the overall cost of generation per kWh ?

(5 marks)

12. (a) A two wire DC distributor AB, 600m long is loaded as under

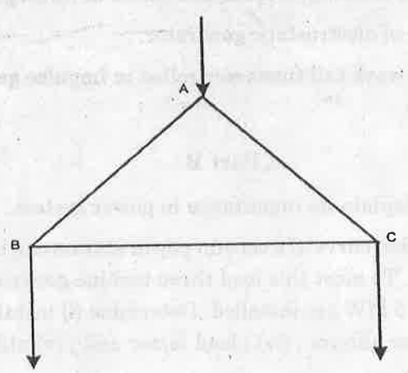
Distance from A (meters)	:	100	250	350	500
Loads in Ampers	:	100	200	250	300

The feeding point A is maintained at 440 V and that of B at 430 V. If each conductor has resistance of 0.01 Ω per 100 m, Calculate, (i) currents supplied from A to B, (ii) the power dissipated in the distributor.

(12 marks)

Or

(b) A 3- phase distribution system is shown in Figure. 1. Power is supplied at A at line voltage of 6.6 kV and balanced loads of 25 A per phase at 0.8 p.f lagging and 35 A per phase at 0.9 lagging p.f are taken at B and C. the impedance of the feeder are AB = (5+ j 9) ohms, BC = (6 + j10) ohms and CA = (4 + j 8) ohms. Calculate the voltges at B and C and currents in each branch. Power facors are assumed w.r.t. voltge at A.



(12 marks)

13. (a) Briefly explain how the conductor size can be economically selected in power system.

(7 marks)

(b) The cost of 3- phase OH transmission line is Rs. (22000 a + 2500) per km where 'a' is the area of X- section of each conductor in cm^2. The line supplying a load of 5 MW at 33 kV. 0.8 p.f. lagging assumed to be constant throughout the year. Energy costs 5 per kWh and interest and depreciation total 10 % per annum. Find the most economical size of conductor. Give that specific resistance of conductor material is 10^{-6} Ω cm.

(c) Briefly explain the adverse effect of low power factor in a power system. (5 marks)

(d) A factory has an average demand of 320 kW and annual load factor of 50%. The power factor is 0.8 lagging. The tariff is Rs. 80 per annum per KVA of maximum demand plus 5 paise per kWh. If the loss free capacitor costing Rs. 100 per kVAR are to be utilized, find the value of power factor at which maximum saving will result. The interest and depreciation together amount to 12%. Also determine the annual saving effected by improving the power factor to this value.

(7 marks)

14. (a) Derive an expression for insulation resistance of a cable. (5 marks)

(b) A 66 kV single core lead sheathed cable is graded by using two dielectrics of relative permittivity of 6 and 4 respectively ; thickness of each being 1.5 cm. The core diameter is 3 cm. Determine the maximum stress in the two dielectrics.

(7 marks)

Or

(c) Explain the capacitance grading of cables.

(d) The Murray loop test is used to locate an earth fault on one core of a two core cable 100m long. The other core is healthy and used to form the loop. At balance, the resistance connected to the faulty core was 4Ω. The other resistance arm has a value of 16Ω. Calculate the distance of fault from the test end.

(5 marks)

15 (a) Describe with a neat sketch, the working of a Van de Graaff generator. What are the factors that limit the maximum voltage obtained ?

(12 marks)

Or

(b) What is the principle of operation of a resonant transformer ? How it is advantageous over the cascade connected transformers ?

(7 marks)

(c) A 12 stage impulse generator has 0.12 μF capacitors with 200kV rating. The wave front and wave tail resistances connected are 1.25 kΩ and 4kΩ respectively. If the load capacitance including that of test object is 1000 pF, find the front and tail times of the impulse wave produced.

(5 marks)

(5 × 12 = 60 marks)

G 6744 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2011

Third Semester

Branch : Electrical and Electronics Engineering

MECHANICAL TECHNOLOGY (E)

(2002 admission onwards)

[Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

1. Why mercury is commonly used in manometers ?
2. Explain the working principle of a piezometer. What is the drawback of piezometer ?
3. Explain the classification of notches.
4. Name any *two* types of minor losses. In each case write the expression for head loss.
5. Explain the terms, gross head and net head as applicable to a hydro electric power plant.
6. What do you mean by efficiency of a draft tube ?
7. Explain the operating characteristics of a centrifugal pump.
8. Explain the term Thoma's cavitation factor.
9. Explain the working of a rotary radial piston pump.
10. What is the effect of vapour pressure on lifting of liquid ?

(10 × 4 = 40 marks)

Part B

11. Find the density of a metallic body which floats at the interface of mercury of specific gravity 13.6 and water such that 30% of its volume is submerged in mercury and remaining portion in water.

(12 marks)

Or

12. A cube of side 's' and relative density 'α' floats in water. Check the stability of the system. If s = 10 cm and α = 0.8 check stability.

(12 marks)

Turn over

13. Derive an expression for the rate of flow through a venturimeter. (12 marks)

Or

14. A 30 cm × 15 cm venturimeter is provided in a vertical pipeline carrying oil of specific gravity 0.9, the flow being upwards. The difference in elevation of the throat section and entrance section of the venturimeter is 30 cm. The differential manometer shows a gauge deflection of 25 cm. Find (a) the discharge of oil and (b) the pressure difference between the entrance section and the throat. Take $C_d = 0.98$.

(12 marks)

15. With neat sketch explain the working of a radial flow reaction turbine. (12 marks)

Or

16. A Kaplan turbine is to be designed to develop 9100 kW. The net available head is 5.6 m. The speed ratio = 2.09, flow ratio = 0.68, overall efficiency = 86% and the diameter of the boss is 1/3rd the diameter of the runner. Find the diameter of the runner, its speed and specific speed of the turbine.

(12 marks)

17. Derive an expression for the specific speed of a centrifugal pump. Explain its significance.

(12 marks)

Or

18. Two geometrically similar pumps are running at same speed of 1000 rpm. One pump has an impeller diameter of 0.3 meter and lifts water at the rate of 20 liters/sec against a head of 15 meters. Find the head and impeller diameter of the other pump to deliver half the discharge.

(12 marks)

19. Show that by fitting air vessels, work can be saved in reciprocating pumps. (12 marks)

Or

20. The length and diameter of a suction pipe of a single acting reciprocating pump are 5 m and 10 cm respectively. The pump has a plunger of diameter 15 cm and stroke length of 35 cm. The centre of the pump is 3 m above the water surface in the pump. The atmospheric pressure head is 10.3 m of water and pump is running at 35 rpm. Find (a) Pressure head due to acceleration at the beginning of the suction stroke and (b) Maximum pressure head due to acceleration.

(12 marks)

[5 × 12 = 60 marks]