Code: 9A02501

B.TECH III Year I Semester (R09) Regular & Supplementary Examinations, November 2012

**ELECTRICAL & ELECTRONIC MEASUREMENTS**

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Derive the equation for deflection in spring controlled PMMC instrument.
(b) The inductance of a moving iron instrument is given by L = (10+5$\theta$-$\theta^2$) $\mu H$ where $\theta$ is the deflection in radians from zero position. The spring constant is 12x$10^{-6}$ Nm/rad. Estimate the deflection for a current of 5 A.

2 (a) Explain the advantages and disadvantages of instrument transformers.
(b) A current transformer with single turn primary has 300 secondary turns and R = 1.5 Ω and X = 1 Ω. When secondary carries 5 A current, magnetising m.m.f at of 100 A and iron loss of 1.2 $\omega$, calculate ratio and phase angle errors.

3 (a) Derive the torque equation of electro dynamometer type watt meter on a.c supply.
(b) What is phantom loading?

4 (a) Describe the construction and working of a d.c potentiometer.
(b) Explain how the potentiometer is Stan dardized.

5 (a) Draw the anderson bridge and explain its working.
(b) An a.c bridge has the following constants.
Arm AB - C = 0.5 $\mu F$ in parallel, with R = 1 k Ω Arm AD - R = 2 k Ω
Arm BC - C = 0.5 $\mu F$ Arm CD - $C_x$ and $R_x$ in series.
Frequency – 1 KHZ, determine unknown capacitance and dissipation factor.

6 How B.H curve is determined using method of revesals?

7 Describe briefly how the following measurements can be made with the use of CRO
(a) Frequency (b) Phase angle (c) Voltage.

8 Explain briefly with neat diagrams the working of the following instruments:
(a) Ramp-type DVM (b) Digital tachometer.

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B.TECH III Year I Semester (R09) Regular & Supplementary Examinations, November 2012

**ELECTRICAL & ELECTRONIC MEASUREMENTS**

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Describe the construction and working of PMMC instrument?
(b) Design an Argton shunt to provide an ammeter with the current ranges 1 A, 5 A AND 10 A. A basic meter resistance is 50 Ω and full scale deflection current is 1 mA.

2 (a) Discuss the major sources of errors in C.T.
(b) Derive the expression for ratio and phase angle errors.

3 (a) Explain the construction details and working principle of low p.f dynamometer type wattmeter.
(b) Explain the difference between a watt and energy meter.

4 (a) With neat diagram explain Compton's dc potentiometer.
(b) What is standard isatation of potentiometer? Why it is necessary?

5 (a) Way Kelvin's bridge is preferred? Derive the bridge balance equation for the Kelvin's double bridge.
(b) What are the sources of errors in case of the Wheatstone bridge?

6 Explain the construction and working principle of a ballistic galvanometer with a neat sketch.

7 (a) Describe in details the vertical amplifier used in a CRO.
(b) Describe briefly how the voltage measurements can be made with the use of CRO.

8 (a) Explain briefly the following:
(i) Digital multimeter (ii) Integrating type DVM.
(b) What is the resolution of a $3^{1/2}$ digit display on 1V and 50 V.

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B.TECH III Year I Semester (R09) Regular & Supplementary Examinations, November 2012

**ELECTRICAL & ELECTRONIC MEASUREMENTS**

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Derive the torque equation for moving iron instruments.
(b) Why scale of moving iron instruments is non-uniform while that of PMMC instruments is uniform.
(c) Design a multirange d.c milliammeter with a basic meter having a resistance 75 Ω and full scale deflection for the current of 2 mA. The required ranges are 0-10 mA, 0-50 mA and 0-100 mA.

2 (a) Explain the construction of
(i) Current transformer (ii) Potential transformer.
(b) Why secondary of C.T should not be open?

3 (a) Explain the function of different parts of a single phase energy meter.
(b) Derive the torque equation of dynamometer wattmeter.

4 (a) Explain the principle of basic potentiometer with neat diagram.
(b) Write a note on applications of a.c potentiometer.

5 (a) How Schering bridge is used for the measurement of unknown capacitor? Derive its balance equation. State its advantages.
(b) List the advantages of using standard capacitor in Maxwell bridge.

6 (a) What is magnetic measurement? Which tests are necessary for the magnetic measurement?
(b) Explain the theory of features of ballistic galvanometer.

7 Draw the block diagram of an oscilloscope and explain briefly its major systems.

8 (a) With the help of a block diagram, describe the working of a successive approximation digital voltmeter.
(b) A voltmeter use $4^{1/2}$ digital display.
(i) Find its resolution (ii) How would the 11.87 V be displayed on a 10 V range
(iii) How would 0.5573 be display on 1 V and 10 ranges?

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Code: 9A02501

B.TECH III Year I Semester (R09) Regular & Supplementary Examinations, November 2012

**ELECTRICAL & ELECTRONIC MEASUREMENTS**

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain the working of (i) attraction type and (ii) repulsion type of moving iron instruments with the help of neat diagrams.

(b) The inductance of a certain moving iron ammeter is $(8 + 4\theta - \frac{1}{2}\theta^2)$ $\mu$H. Where $\theta$ is the deflection in radian from the zero position. The control spring torque is $12 \times 10^{-6}$ N-m/rad. Calculate the scale positions in radian for currents 2,3 and 5 A and discuss the scale shape obtained.

2 (a) Draw the equivalent circuit and phasor diagram of a current transformer.

(b) Describe 1-$\phi$ p.f meters.

3 (a) Explain the function of different parts of a single phase energy meter.

(b) Derive the torque equation of electro dynamometer type wattmeter on a.c supply.

4 (a) Describe the circuit diagram of Crompton's potentiometer. Describe the steps used when measuring an unknown resistance.

(b) Write a note on applications of a.c potentiometer.

5 (a) Explain how Wien's bridge can be used for experimental determination of frequency. Derive the expression for frequency in terms of bridge parameters.

(b) Derive the equations of balance for an Anderson's bridge.

6 Describe the method for determination of B.H curve of a magnetic material using:
(i) Reversals (ii) Six point method.

7 (a) Explain how the following are determined from the trace on a CRT:
(i) The r.m.s value of a sin wave.
(ii) The phase difference between the voltages.

(b) Explain the principle and operation of vertical amplifier with neat supporting diagrams.

8 (a) Give the advantages and disadvantages of digital instruments over analog instruments.

(b) Explain the working principle of digital tachometer with the help of neat diagram.

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Code: 9A02502

1

III B. Tech I Semester (R09) Regular & Supplementary Examinations, November 2012

**TRANSMISSION OF ELECTRIC POWER**

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

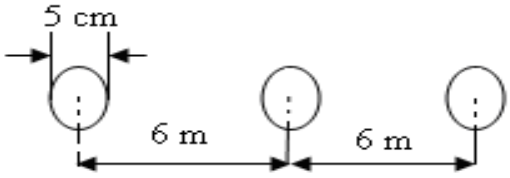
Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Show that the capacitance per conductor per meter of a double circuit regular hexagonal spacing transmission line is $C = \frac{2\pi\varepsilon_0}{\ln\frac{\sqrt{3}D}{2r}}$ F/meter/conductor, Where D is conductor spacing and r is the radius of the conductor.

(b) Determine the inductance per km per phase of a single circuit 20 kV line of given configuration as shown in fig. The conductors are transposed and have a diameter of 5 cm.




2 (a) Explain the physical significance of the generalized A, B, C, D constants of a transmission line. State the units of these constants.

(b) Using nominal -T method find A, B, C, D parameters of a 3-Φ 80 km long 50 Hz transmission line with series impedance of (0.15+j0.78)Ω per km and a shunt admittance of $5\text{x}10^{-6}$ mho per km.

3 Starting from the fundamentals determine the equivalent-T network parameters of a long transmission line. And also prove AD-BC=1 for the same network.

4 A 3-Φ transmission line has conductors 1.5 cm in diameter spaced 1 m apart in equilateral formation. The resistance and leakage are negligible. Calculate:
(i) the natural impedance of the line
(ii) the line currents if a voltage wave of 11 kV travels along the line
(iii) the rate of energy absorption ,the rate of reflection and the state and the form of reflection if the line is terminated through a star connected load of 1000 Ω/ph.

5 Write short notes on:
(a) Corona.
(b) Radio interference.
(c) Power loss due to corona.

Contd. in Page 2

6 (a) Deduce the mathematical expression for potential distribution over a string of 4 insulator discs.

(b) The three bus bar conductors in an outdoor substation are supplied by units of post insulators. Each unit consists of a stack of 3-pin type insulators fixed one on the top of the other. The voltage across the lowest unit is 8.45 kv and that across next is 7.25 kv. Find the bus bar voltage of the station.

7 Assuming the shape of an overhead line can be approximated by a parabola, deduce the expression for the sag, tension and conductor length. How can the effect of wind and ice loadings are taken in to account?

8 (a) Write down the advantages of underground cable over overhead transmission lines.

(b) A single-core cable has a conductor diameter of 2.5 cm and insulation thickness of 1.2 cm. If the specific resistance of insulation $4.5\times10^{14}$ ohm-cm, calculate the insulation resistance per kilo mere length of the cable.

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Code: 9A02502

III B. Tech I Semester (R09) Regular & Supplementary Examinations, November 2012

**TRANSMISSION OF ELECTRIC POWER**

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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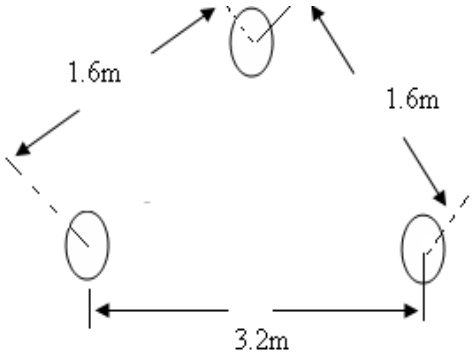
1 (a) Find the expression for inductance of a two-wire 1- ø transmission line.

(b) Determine the inductance of a three phase line operating at 50 Hz and conductors arranged as follows: The conductor diameter is 1 cm.




Fig

2 An overhead 3-Φ short transmission line delivers 4000 kW at 11 kV at 0.8 pf lagging. The resistance and reactance of earth conductor are 1.5Ω and 4Ω per phase respectively. Determine:
(i)The sending end line voltage. (ii) Percentage regulation. (iii)Transmission efficiency.

3 Determine the sending end voltage current and power for 160 km section of 3-Φ line delivering 45 MVA at 132 KV and pf 0.8 lagging. Also, find the efficiency and regulation of line. Resistance per line is 0.16 Ω/km, spacing is 3.5 m, 6.5 m and 7.4 m transposed. Diameter of the conductor is 1.9 cm.

4 Derive the expression for transient current wave, show that transient current is sum of incident current, and reflected current.

5 A 110 KV, 3 Phase, 50 Hz transmission line, 175 km long consists of three 1 cm diameter stranded copper conductors spaced in 3-meter delta arrangement. Temperature taken at $26^0$C and barometric pressure as 74 cm of mercury. Assume surface irregularity factor $m_0$=0.85, $m_v$ for local corona = 0.72 and $m_v$ for general corona = 0.82 Find critical voltages and power loss.

6 (a) Explain about the improvement of string efficiency using longer cross arms.

(b) A string of 5 insulator units has a self-capacitance is equal to 11 times the pin to earth capacitance. Calculate the string efficiency if the operating voltage is 66 kv.

7 Deduce the expressions for total length of conductor, tension and sag when the transmission line conductors are supported on transmission line towers.

8 Write short notes on: (a) Intersheath grading. (b) Capacitance grading.

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Code: 9A02502

3

III B. Tech I Semester (R09) Regular & Supplementary Examinations, November 2012

**TRANSMISSION OF ELECTRIC POWER**

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

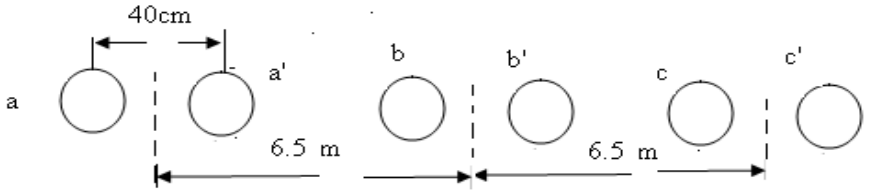
Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Starting from the fundamentals derive the expression for the inductance of a 3-ø un-symmetrically spaced transmission line.

(b) Determine the capacitance and charging current per km of a single circuit 220 kV line using two bundle conductors per phase as shown in the figure. The diameter of each conductor is 4.5 cm




2 Derive the expressions for efficiency and regulation and A, B, C, D parameters of a nominal-$\pi$ medium length transmission line by using its phasor diagram.

3 Starting from the fundamentals determine the equivalent-T network and equivalent-$\pi$ network parameters of a long transmission line.

4 A surge of 25kV traveling on a line of natural impedance 500ohms arrives at a junction with two lines of impedances 500ohms and 50ohms respectively. Find the surge voltages and currents transmitted into each branch line. Also find the reflected surge voltage and current.

5 (a) Discuss the effect of the size of the conductor on Corona loss.

(b) A certain 3-phase equilaterally spaced transmission line has a total corona loss of 55 KW at 110 kv and a loss of 110 KW at 120 KV. What is the disruptive critical voltage between lines? What is the corona loss at 125kv?

6 (a) Explain about the improvement of string efficiency by grading of units.

(b) A three phase overhead line is suspended by a suspension type insulator, which consists of three units. The potential across top unit and middle unit are 12 kv and 18 kv respectively. Calculate: (i) The ratio of capacitance between pin and earth to the self capacitance of each unit (ii) The line voltage and (iii) String efficiency.

7 (a) Derive the expressions for sag and tension when the supports are at equal heights

(b) An overhead transmission line at a river crossing is supported from two towers at heights of 40 m and 90 m above water level. The horizontal distance between the towers being 400 m. If the maximum allowable tension is 2000 kg, find the clearance between the conductor and water at a point mid-way between the towers. Weight of conductor is 1 kg/m.

8 What is the necessity of grading of cables? Explain briefly the various grading methods of cables.

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Code: 9A02502

4

III B. Tech I Semester (R09) Regular & Supplementary Examinations, November 2012

**TRANSMISSION OF ELECTRIC POWER**

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

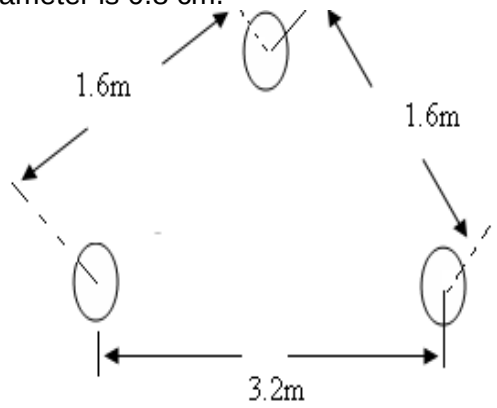
Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Derive the expression for the capacitance of a 3- ø double circuit hexagonal spacing configuration.

(b) Determine the inductance of a 3- ø line operating at 50 Hz and conductors arranged as follows. The conductor diameter is 0.8 cm.




Fig

2 Derive the expressions for efficiency and regulation and A, B, C, D parameters of a nominal-$\pi$ medium length transmission line by using its phasor diagram.

3 A three phase 200km long high voltage line has Z=(14.1+j51.48)ohms and y=(0+j1.194x$10^{-6}$) siemens. Find the characteristic impedance, propagation constant and constants A, B, C and D for the line.

4 A surge of 200 kV traveling on a line of natural impedance 500 ohms arrives at a junction with two lines of impedances 700 ohms and 300 ohms respectively. Find the surge voltages and currents transmitted into each branch line. Also find the reflected surge voltage and current.

5 (a) Write short notes on radio interference due to corona.

(b) A 3-phase line has conductors of radius 1.0 cm, spaced at the corners of an equilateral triangle of side 2.5 m apart. If the dielectric strength of air is 30kv/cm. determine disruptive critical voltage at which corona will occur. Take air density factor $\delta$ is 0.96 and irregularity factor $m_0$ is 0.94. Assume the required data.

Contd. in Page 2

6 Each line of a three-phase system is suspended by a string of three identical insulators of self-capacitance of C farad. The shunt capacitance of connecting metalwork of each insulator is 0.2 C to earth and 0.1C to line. Calculate the string efficiency of the system and also calculate string efficiency if a guard- ring increases the capacitance to the line of metal-work of the lowest insulator to 0.3 C.

7 (a) What are the factors affecting the sag?
(b) An overhead line at a river crossing is supported from two towers of height 50 m and 80 m above water level with a span of 300m, the working tension is 2000 kg. Determine the clearance between the conductor and the water level midway between the towers. Weight of the conductor per meter=0.844 kg. Assume that the conductor takes the shape of parabolic curve.

8 (a) Briefly discuss grading methods used for the cables.
(b) A 33 kv single core cable has a conductor diameter of 10 mm and sheath of inside diameter of 40 mm. Find the maximum and minimum stress in the insulation.

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Code: 9A02503

III B. Tech I Semester (R09) Regular & Supplementary Examinations, November 2012

**CONTROL SYSTEMS**

(Common to EEE, E.Con.E, EIE, ECE & MCT)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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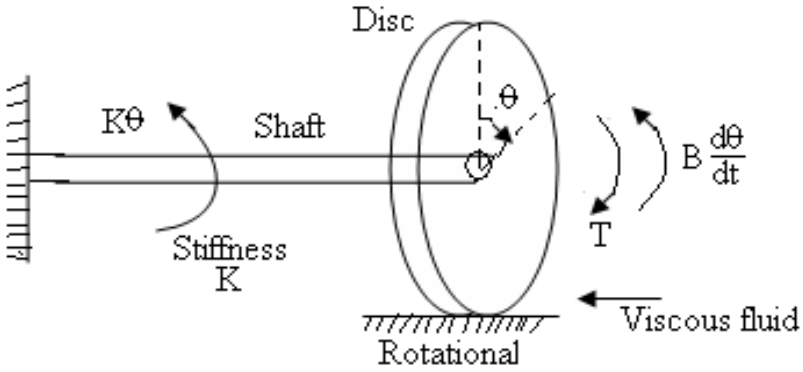
1 Derive the transfer function for the following rotational mechanical systems shown in the figure.




2 Derive the transfer function for a.c. servomotor. Explain about torque-speed characteristics of AC servomotor.

3 For a unity feedback control system the open loop transfer function
$G(s) = 10(s+2)/ s^2(s+1)$.Find: (a) position, velocity and acceleration error constants.
(b)Steady state error when the input $R(s) = (3/s)-(2/ s^2)+(1/3 s^3)$.

4 Sketch the root locus for the given system with $G(s)H(s)=(K( s+1))/(s (s+2))$.

5 (a) Define the following terms:
(i) Resonant peak (ii) Resonant frequency (iii)Band width (iv) Cut off rate

(b) Draw the Bode phase plot for the system having the following transfer function (s)=2000(s+1)/[s(s+10)(s+40)].

6 Check stability of the system by Nyquist criterion $G(s) = 10/[s^2(1+0.2s)(1+0.5s)]$.

7 Consider a unity feedback system with G(s) =75/(s+1) (s+3) (s+8). Design a PID controller to satisfy the following specifications.
(i) $K_v \geq 12$ (ii) Damping ratio = 0.6 (iii) $\omega_n$ = 2 rad/sec

8 A linear time invariant system is characterized by the state equation:

$$\begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} r(t)$$

With the step input and the initial conditions are $X_0 = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$.

Find the solution of the state equation.

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Code: 9A02503



III B. Tech I Semester (R09) Regular & Supplementary Examinations, November 2012

**CONTROL SYSTEMS**

(Common to EEE, E.Con.E, EIE, ECE & MCT)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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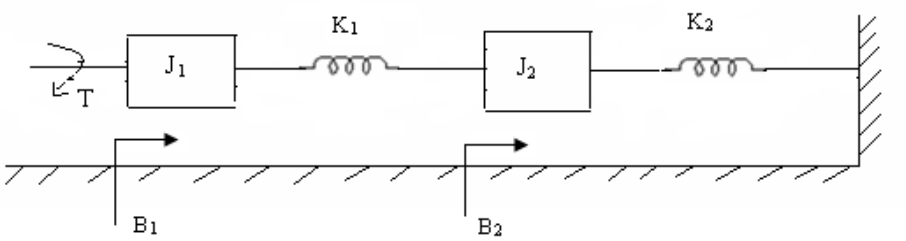
1 (a) Explain the following terms with respect to closed loop control systems:
(i) Plant (ii) Reference input (iii) Error detector (iv) Controller

(b) Write the differential equations governing the mechanical rotational systems shown in figure.




2 (a) Derive the transfer functions of an AC servomotor.

(b) Explain the operation and working principle of Synchro.

3 Consider a unity feedback system with a closed loop transfer function $\frac{C(s)}{R(s)} = \frac{Ks+b}{s^2+as+b}$. Determine the open loop transfer function G(s). Show that the steady state error with unit ramp input is given by (a-K)/b.

4 Consider the sixth-order system with characteristic equation
$s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$. Comment on the stability.

5 Define the following terms: (i) Resonant peak (ii) Resonant frequency
(iii)Band width (iv) Cut off rate (v) Gain Margin (vi) Phase margin
(vii) Phase cross over frequency (viii)Gain cross over frequency

6 (a) Explain Nyquist stability criterion.

(b) In addition to providing absolute stability, the Nyquist criterion also gives information on the relative stability. Justify.

7 A unity feedback system has an open loop transfer function as G(s)=50/(s+3)(s+1). Design a PI controller so that phase margin of the system is $35^0$ at a frequency of 1.2 rad/sec.

8 (a) Derive the expression for the transfer function from the state model.
$\dot{x} = Ax + Bu$ and $y = Cx + Du$

(b) Obtain state variable representation of an armature controlled D.C. motor.

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Code: 9A02503

3

III B. Tech I Semester (R09) Regular & Supplementary Examinations, November 2012

**CONTROL SYSTEMS**

(Common to EEE, E.Con.E, EIE, ECE & MCT)

Time: 3 hours Max. Marks: 70

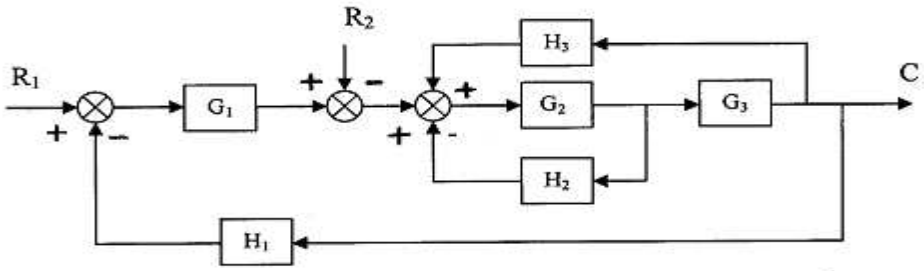
Answer any FIVE questions

All questions carry equal marks

*****

1 Distinguish between: (a)Linear and nonlinear systems
(b)Single variable and multi variable control systems
(c)Time – variant and time-invariant control systems
(d) Lumped and distributed control systems
Give an example for each of the above.

2 For the system represented in the given figure, obtain transfer function:
(a) C/R1 (b) C/R2




3 (a) Explain about various test signals used in the control systems.
(b) For the servomechanism with open loop transfer function given below, what type of input signal give rise to a constant steady state error and calculate their values
$G(s) = 10/ [s^2(s+1) (s+2)]$.

4 Sketch the root locus for the unity feedback system whose open loop transfer function is
$G(s) H(s) = K(s+1.5)/[s(s+1)(s+5)]$.

5 (a) Explain the procedure to determine the transfer function from bode plots.
(b) Draw the bode phase plot for the system having the following transfer function
$G(s)= 20/[s(1+3s)(1+4s)]$.

6 (a) How is Nyquist contour selected when the open loop transfer function has a pole at origin? Explain.
(b) Draw the polar plots for the following:
(a) $G(s) = 1/(1+sT)$ (b)$G(s) = 1/[s^2(1+sT_1)(1+sT_2)(1+sT_3)]$.

7 Consider a unity feedback system with open loop transfer function, $G(s)=20/s(s+2)(S+4)$. Design a PD controller so that the damping ratio of 0.8 and natural frequency of oscillations as 2 rad/sec.

8 Obtain the stat variable model in phase variable form for the following system:

$$\dddot{y} + 2\ddot{y} + 3\dot{y} + 4y = u(t).$$

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Code: 9A02503

4

III B. Tech I Semester (R09) Regular & Supplementary Examinations, November 2012

**CONTROL SYSTEMS**

(Common to EEE, E.Con.E, EIE, ECE & MCT)

Time: 3 hours Max. Marks: 70

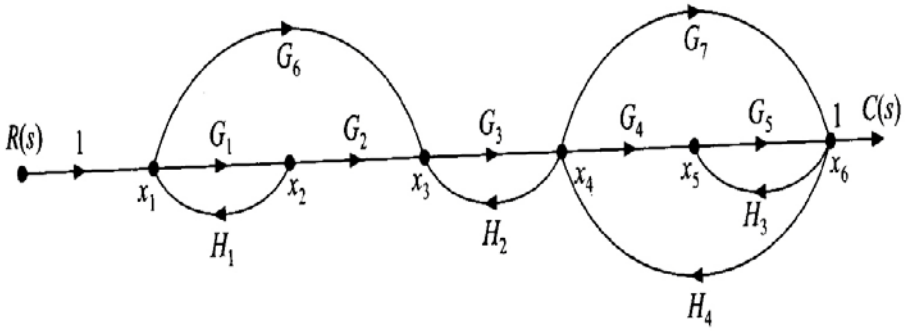
Answer any FIVE questions

All questions carry equal marks

*****

1 Define and explain the following terms:
(i) Characteristic equation.
(ii) Order of a transfer function.
(iii) Type of a transfer function.
(iv) Poles and zeros of a transfer function.

2 Obtain the transfer function using mason gain formula for the signal flow graph shown in figure.




3 (a) Define the following terms:
(i) Steady state error. (ii) Settling time.
(iii) Peak over shoot. (iv) Type and order of the control system.
(b) Find the steady state error for unit step, unit ramp and unit parabolic inputs for the following system: G(s) = 1000(s+1)/[(s+10)(s+50)]

4 Sketch the root locus for the unity feedback system whose open loop transfer function is $G(s)H(s)=K(s^2+6s+25)/[s(s+1)(s+2)]$.

5 Sketch the Bode plot for the transfer function given by G(s) H(s) = 2/[s(s+1) (1+0.2s)]. Also obtain gain and phase margin and cross over frequencies.

6 Sketch the polar plot for following transfer function and from the plot determine the phase margin and gain margin $G(s) = 200(s+2)/s(s^2 + 10s+100)$

7 Consider a unity feedback system with open loop transfer function, G(s)=K/s(2s+1)(0.5s+1). Design a suitable lag-lead compensator to meet the following specifications. (i) $K_v=30$ (ii) Phase margin ≥ 50.

8 (a) Define the terms (i) State variables and (ii) State transition matrix.
(b) Obtain the state model for a simple RLC series circuit.

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Code: 9A02504

III B. Tech I Semester (R09) Regular & Supplementary Examinations, November 2012

**POWER ELECTRONICS**

(Common to Electrical & Electronics Engineering & Electronics & Control Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Give the construction details of an SCR with the help of schematic diagram and the circuit symbol.

(b) Explain the importance of gate signal in SCR.

2 Explain in detail the concept of thyristor ratings.

3 (a) Distinguish between a half controlled and fully controlled rectifiers with regard to input and output performance.

(b) Calculate the average current through a load resistance of 100 ohm when it is connected in series with a large inductance across the terminals of a half controlled single phase bridge circuit.

4 (a) Show that the effect of source inductance on the performance of single phase fully converter is present an equivalent resistance of ωLs/π ohms in series with the internal rectifier voltage.

(b) Mention the advantages and disadvantages of source inductance.

5 (a) Explain the operation of three phases fully controlled bridge converter with R load with associate waveforms.

(b) Why the circulating current mode preferred over non circulating current mode in dual converter?

6 (a) Describe three-phase to three-phase cycloconverter with relevant circuit arrangements using 18 thyristors and 36 thyristors. What are the advantages of three-phase bridge over three-phase to three-phase cycloconverter circuit consisting of 18 thyristors?

(b) A single-phase to single-phase mid-point cycloconverter is delivering power to a resistive load. The supply transformer has a turn's ratio of 1:1:1. The frequency ratio is f0/fs =1/5. The firing delay angle α for all four SCRs are the same. Sketch the time variations of the following waveforms for $\alpha=0^0$ and $30^0$.

(a) Supply voltage (b) Output current (c) Supply current

7 Write short notes on:

(i) Control strategies for chopper operation.

(ii) Steady state time-domain analysis of type-A chopper.

(iii) Multiphase choppers.

8 (a) What are the various PWM techniques used for 1-phase bridge inverter?

(b) Explain the operation of 1-phase full bridge inverter with PWM technique.

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Code: 9A02504

III B. Tech I Semester (R09) Regular & Supplementary Examinations, November 2012

**POWER ELECTRONICS**

(Common to Electrical & Electronics Engineering & Electronics & Control Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain terminal characteristic of a thyristor with reverse blocking mode and forward blocking mode with the help of an elementary circuit.

(b) Explain why gating should not be done when it is reverse biased.

2 Explain briefly the triggering circuit for SCR. Explain the circuit's necessary to protect an SCR from false triggering.

3 (a) Derive the expression for output voltage of single phase half controlled converter in its various modes of operation when feeding to RL load.

(b) In a single phase midpoint converter, turns ratio is 1.25. The source voltage is 130 V, 50 Hz. For resistive load of R=2 ohm, determine:
(i) Maximum possible values of positive and negative voltages across SCRs.
(ii)Maximum output voltage and current and the corresponding firing and conduction angles.
(iii) The value of firing angle for load voltage of 100 V.

4 Derive an expression for (a) Average load voltage (b) Average load current (c) RMS load voltage for a 1-phase fully controlled converter with resistive and inductive load.

5 (a) Explain the operation of a three phase half-wave rectifier with R-load with suitable waveforms .

(b) Derive expressions for average voltage and current of 3-phase half-wave rectifier.

6 (a) Draw the V-I characteristics of a triac and explain is working principle.

(b) A heater load is controlled through a triac from a single-phase source. Determine the firing angle delay when the power is at:
(i) 50%. (ii) 70% of its maximum power. Derive the expressions used.

7 (a) Draw a schematic diagram of a single-phase a.c. chopper and discuss in brief with output voltage and current waveforms.

(b) Distinguish the main features of d. c and a. c chopper

8 (a) How is the output voltage and frequency of a PWM inverter varied?

(b) What are the advantages and drawbacks of PWM inverter over square wave (or) quasi square wave?

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Code: 9A02504

III B. Tech I Semester (R09) Regular & Supplementary Examinations, November 2012

**POWER ELECTRONICS**

(Common to Electrical & Electronics Engineering & Electronics & Control Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Discuss the various breakdown voltages of power BJT.
(b) Explain in brief the second breakdown phenomenon in a power BJT.

2 Draw the R-triggering circuit and explain with proper waveforms.

3 (a) Describe the operation of a 1-phase two-pulse midpoint converter with relevant voltage and current waveforms.
(b) Discuss how each SCR is subjected to a reverse voltage equal to double the supply voltage incase turns ratio from primary to secondary is unity.

4 A 1-phase SCR is operated from a 50 Hz, 240 V AC source. If a resistive load of 100 ohm is connected at the dc terminals of the converter and the average output voltage is 25% of the maximum possible average output voltage. Calculate:
(a) Firing angle delay. (b) The average and rms load current.

5 (a) Describe the working principle of six pulse converter with R-load and draw associate waveforms.
(b) The 3 phase half wave converter is operated from a three phase star connected 220 V, 50 Hz supply and load resistance is 10 Ω. If the average output voltage is 25% of maximum possible output voltage, calculate the firing angle and rms output current.

6 (a) List the advantages and disadvantages of single phase half-wave (unidirectional) ac voltage regulator.
(b) A single-phase a.c. voltage regulator with R-L load has the following details: Supply Voltage: 230 V at 50 Hz, R = 4 Ω and ωL= 3 Ω.
Calculate: (i) The control range of firing angle,
(ii) The maximum value of rms load current,
(iii) The maximum power and power factor.

7 (a) Explain in detail the steady-state time domain analysis of type- A chopper.
(b) For type-A chopper, dc source voltage=230 V, load resistance=10 Ω. Take a voltage drop of 2 V across chopper when it is on. For a duty cycle of 0.4, calculate
(i) Average and rms values of output voltage. (ii) Chopper efficiency.

8 (a) Why voltage control is needed in inverter circuits?
(b) State the various methods of voltage control in inverter circuits and explain each of them briefly.

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Code: 9A02504

III B. Tech I Semester (R09) Regular & Supplementary Examinations, November 2012

**POWER ELECTRONICS**

(Common to Electrical & Electronics Engineering & Electronics & Control Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Discuss the basic difference between BJTs and MOSFETs.
(b) Why don't MOSFETs have second breakdown?

2 (a) Explain the two transistor analogy of the thyristor.
(b) Explain the constructional details of IGBT and characteristics.

3 (a) Explain the construction and operation with waveform of 1-phase semi-converter with freewheeling diode.
(b) Give the advantages of freewheeling diode.

4 A single phase full converter delivers power to a resistive load R. For ac source voltage Vs, show that average output voltage Vo is given by $V_0 = \frac{\sqrt{2}V_s}{\Pi}(1+\cos\alpha)$

(a) Sketch the time variations of source voltage, output voltage, output current and voltage across one pair of SCRs. Hence find there from the circuit turn-off time.
(b) For the converter of part (a), show that rms value of output current is given by

$$I_{0r} = \frac{V_s}{R}\left[\frac{1}{\Pi}\left\{(\Pi-\alpha)+\frac{1}{2}\sin 2\alpha\right\}\right]^{\frac{1}{2}} \ldots\ldots\ldots\ldots\ldots$$

5 (a) With suitable circuit diagram explains the operation of a three phase full-wave uncontrolled rectifier and draw associate waveforms.
(b) Derive expressions of average voltage, average current and RMS current for 3-phase controlled rectifier.

6 (a) For a single-phase ac voltage regulator feeding a resistive load, show that the power factor is given by the expression [1/π {π-α}+ sin2α/2]1/2.
(b) A single-phase voltage controller uses burst firing control for heating a load of R=5 Ω with an input voltage of 230 V, 50 Hz. For a load power of 5 kW, determine:
(i) the duty cycle (ii) input power factor (iii) average and rms thyristors currents.

7 (a) What is a dc chopper? Describe the various types of chopper configurations with necessary sketches.
(b) A d. c. chopper circuit connected to a 100 V d. c. source supplies an inductive load having 40 mH in series with a resistance of 5 Ω. A freewheeling diode is placed across the load. The load current varies between the limits of 10 A and 12 A. Determine the time ratio of the chopper.

8 (a) What are the different PWM techniques employed for inverters?
(b) Explain the operation of single pulse modulation of inverter with neat diagram.

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Code: 9A02505

III B. Tech I Semester (R09) Regular & Supplementary Examinations, November 2012

**ELECTRICAL MACHINES III**

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain the effect of harmonics on pitch and distribution factors.

(b) An alternator has 18 slots/ pole and the first coil lies in slots 1 and 16. Calculate the pitch factor for:
(i) Fundamental (ii) 3rd harmonics (iii) 5th harmonics and (iv) 7th harmonics.

2 (a) Explain the effects of harmonics on electrical power system & utility.

(b) Calculate the RMS value of EMF induced per phase of a 10 pole, 3- phase, 50 Hz, alternator with 2 slots per pole per phase and 4 conductors per slot in two layers. The coil span is $150^{o}$ electrical. The flux per pole has a fundamental component of 0.12 wb & a 20% of third harmonic component

3 A 3-ф, 200 kVA, 1.1 kV, 50 Hz star connected alternator having an effective per phase resistance of 0.62 Ω gave the following results:

| Field current (A) | 20 | 35 | 50 | 80 | 100 | 120 |
|---|---|---|---|---|---|---|
| O.C. Voltage $V_1$ | 692.82 | 1120 | 1450 | 1750 | 1953 | 2180 |
| S.C. Current (A) | 0 | 22 | 44 | 66 | 88 | 110 |

Using MMF method, find the voltage regulation at 100 A,
(a) 0.8 p.f. lagging (b) 0.8 p.f leading.

4 (a) What is meant by synchronization? How the alternator is synchronized with infinite bus?

(b) A 3-phase alternator with synchronous reactance of 10 ohm per phase and negligible armature resistance is connected to 6.6 kV constant frequency supply and it supplies 100 A at unity power factor to the system. If the prime mover input is kept constant and the excitation of the alternator is increased by 20%. What would be the new current and power factor?

5 (a) The full load current of a 3.3 kV, star connected synchronous motor is 160 A at 0.8 pf lagging. The resistance & synchronous reactance of the motor are 0.8 Ω/ph & 5.5 Ω/ph respectively. Calculate the excitation EMF, torque angle, efficiency, and the shaft output of the motor. Assume the mechanical stray losses to be 30 kW.

(b) What is the over excitation of asynchronous motor? What is the effect of over excitation of a synchronous motor?

6 (a) What is hunting? Why it is essential to suppress the hunting?

(b) Explain the various staring methods of synchronous motor.

7 (a) Why a capacitor start motor is better than split-phase motor, explain?

(b) Describe the construction and working of shaded pole motor.

8 With neat diagram explain the construction & working of variable reluctance step-per motor. Also explain its static & dynamic characteristics.

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Code: 9A02505

2

III B. Tech I Semester (R09) Regular & Supplementary Examinations, November 2012

**ELECTRICAL MACHINES III**

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Briefly describe the phase spread, phase band. Calculate their values for integral slot winding with suitable example.

(b) A 3- phase star connected alternator has rating of 120 kVA at 2.5 kV with 12 poles. The rated speed of the alternator is 800 rpm. There are three slots per pole per phase and the number of conductors per slot is 5. Determine the flux per pole for full pitched winding to give the rated terminal voltage at no load.

2 The effective resistance of a 2200 V, 50 Hz, 440 kVA single phase alternator is 0.5 ohm. On short circuit, a field current of 4 amp, gives the full load current. The EMF on open circuit for the same field current is 1160 V. find synchronous impedance, synchronous reactance and %regulation of 0.6 p.f lagging.

3 Explain the 'Zero Power Factor' method of finding voltage regulation of an alternator.

4 (a) What is meant by synchronization? Explain the way of synchroning an alternator to the infinite bus bars.

(b) Two star connected alternators supply a load of 1500 kVA at 0.8 pf lagging and share the load equally. The excitation of second machine is adjusted so that it is supplying 60 A at a lagging pf. The synchronous impedances are (0.4 + j12) ohm /ph and (0.5 + j10) ohm /ph. Find current, power factor, induced EMF and load angle of each machine. Terminal voltage is 6.6 kV.

5 (a) A sub-station operating at full load of 1200 kVA supplies a load at 0.7 power factor lagging. Calculate the permissible additional load at this power factor and the rating of synchronous condenser to raise the substation power to 0.9 lagging.

(b) Explain why synchronous motor is not self starting.

6 (a) What is hunting? Why it is essential to suppress the hunting?

(b) Explain the construction of damper winding.

7 (a) Explain the principle of operation of single phase induction motor based on double field revolving theory.

(b) Compare the capacitor start motor and capacitor start and run single phase induction motor. Which type of motor has better performance, Explain?

8 (a) List applications of stepper motor & universal motor.

(b) Explain the construction of AC series motor.

*****

Code: 9A02505

3

III B. Tech I Semester (R09) Regular & Supplementary Examinations, November 2012

**ELECTRICAL MACHINES III**

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain the effect of short chording and spreading the winding in a 3-phase alternator on the emf induced in the winding. Derive the expressions for these effects in terms of slot pitch, number of slots per pole per phase and short chording.

(b) Describe the merits of fractional slot winding. Why its armature slots should be divisible by 3 in case of 3-phase machine?

2 (a) Explain the effect of armature reaction on the EMF induced. Is it possible to obtain load voltage more than EMF induced? If yes, how?

(b) The phase EMF of a 3-phase alternator consists of fundamental, 20 % 3rd harmonic & 10 % fifth harmonic. The amplitude of fundamental is 1000 V. Calculate the RMS value of line & phase voltage, when the alternator is connected in (i) Star (ii) Delta.

3 A 1 MVA, 11 kV,3- phase star-connected synchronous machine has following OCC test data,

| $I_f$ | 50 | 110 | 140 | 180 |
|---|---|---|---|---|
| $E_{ol}$-kV | 7 | 12.5 | 13.75 | 15 |

(Where $E_{ol}$ is the line voltage at no load ) the short circuit test yielded full load current at a field ZPF yielded a full load current at terminal voltage for a field current of 150 A. the armature resistance is negligible. Calculate the voltage regulation at full load of 0.866 p.f lagging by potier triangle method.

4 (a) Explain the way of parallel operation of two alternators and synchroning an alternator to the infinite bus bars.

(b) Two star-connected alternators are connected in parallel to supply a load of 1500 kVA at 11 kV line voltage and 0.8 pf lagging power factor. By suitable adjustment of prime mover governors the two alternators can share the load equally. The excitation of one machine is adjusted so that it is supplying 43 A at a lagging pf. The synchronous reactances of the two machines respectively are: 35ohm and 40 ohm. Find phase current in the second machine, induced EMF of each machine, power factor at each machine operates.

5 (a) Explain why synchronous motor is not self starting.

(b) A 3-phase, 600 V, star connected synchronous motor has effective per phase armature resistance & synchronous reactance of 0.4Ω & 3.6Ω respectively. Calculate the induced EMF per phase if the motor works on full load delivering 326 kW. The full load efficiency is 87 % having power factor of 0.8 leading. Also calculate the load angle.

6 (a) Explain the various starting methods of synchronous motor.

(b) Explain the construction of damper winding.

7 (a) Why a capacitor start motor is better than capacitor start and run, explain?

(b) With neat diagrams explain the construction and working of shaded pole motor.

8 With neat diagram explain the construction and working of:
(a) AC series motor. (b) Permanent magnet stepper motor.

*****

Code: 9A02505

4

III B. Tech I Semester (R09) Regular & Supplementary Examinations, November 2012

**ELECTRICAL MACHINES III**

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain the differences between stationary armature and rotating armature. What are the advantages of rotating armature over stationary armature?

(b) Describe the merits of fractional slot winding. Why its armature slots should be divisible by 3 in case of 3-phase machine?

2 (a) Explain the factors affecting synchronous reactance of alternator.

(b) Calculate the RMS value of EMF induced per phase of a 10 pole, 3-phase, 50 Hz, alternator with 2 slots per pole per phase and 4 conductors per slot in two layers. The coil span is $150^{o}$ electrical. The flux per pole has a fundamental component of 0.12 Wb & a 20% of third harmonic component.

3 A 3-ф, 440 V, 50 Hz, delta connected alternator has a direct axis and quadrature axis reactance of 0.12 Ω and 0.09 Ω respectively. If the alternator supplies 900 A at 0.8 p.f lagging, calculate the following: (a) The excitation E.M.F, neglecting saliency (Xd=Xq).
(b) The excitation E.M.F, taking into account the saliency.
Neglect armature resistance.

4 (a) Describe the effects of change in excitation and change in prime mover input of the alternator. How they are useful in the operation of alternator?

(b) A 15 MVA, 11 kV, 50 Hz, 3-phase, 4-pole star connected cylindrical-rotor synchronous generator supplies at rated output at pf of 0.9 lagging to an infinite bus bar. Its synchronous reactance is 0.35 pu. Determine the synchronizing torque for a shaft displacement of $0.4^{o}$ (mechanical). Neglect losses and saturation.

5 (a) What is a synchronous condenser? What is the use of synchronous condensers?

(b) A 220 V, 3-phase, star connected synchronous motor has a resistance of 0.22 ohm per phase and a synchronous reactance of 2.4 ohm per phase. The motor is operating at 0.6 pf leading with a line current of 180 A. Determine the value of generated e.m.f.

6 (a) Explain the procedure to plot 'V curves' & 'inverted V' curves for a given synchronous machine with help of its circles diagrams.

(b) Calculate the synchronous coefficient (in kW & Nm per mechanical degree) at full load for a 1 MVA, 0.8 pf lagging, 6.6 kV, 8 pole, star connected generator of negligible resistance & synchronous reactance of 0.8 pu.

7 (a) Why the single phase induction motors are not self starting explain with the help of double field revolving theory?

(b) Explain the construction and operation of capacitor start and run single phase induction motor.

8 (a) Describe the working of dc series motor when connected to ac supply. What modifications have to be adopted to achieve the satisfactory operation?

(b) With neat diagram explain the construction and working of reluctance motor.

*****

Code: 9AHS401

**1**

B.Tech III Year I Semester (R09) Regular and Supplementary Examinations, November 2012

**MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS**

(Common to CE, BT, ME, EEE, ECC and MCT)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 What is demand? Explain the various factors that influence the demand for a computer.

2 What elasticity of demand is important? Explain the factors governing elasticity of demand.

3 What is break even analysis? How do you determine breakeven point? Illustrate.

4 What is market? Distinguish between perfect and imperfect markets.

5 Explain the features of sole trader form of organization. Discuss the merits & demerits of sole trades form of organization?

6 (a) What is the importance of Capital Budgeting?

(b) How do the discounting models differ from non-discounting models?

7 Journalize the following transactions and prepare Ledger accounts in the books of Mr. A.V. Narayana.

| | |
|---|---|
| 2006, June, 1 | Commenced business with cash worth Rs.80,000 |
| 5 | Discount allowed worth Rs.5,000 |
| 8 | Cash received from Swamy worth Rs.25,000 |
| 12 | Rama Rao purchased goods worth Rs.6,000 |
| 15 | Audit Fees worth Rs.2,000 |
| 18 | Received interest from Narayana worth Rs.18,000 |
| 24 | Bought goods from Prasad &Co. worth Rs.12,000 |
| 30 | Printing & Stationary expenses worth Rs.4,000 |

8 Who are the users of financial statements of a business unit and explain how differently they interpret the financial data?

*****

Code: 9AHS401

**2**

B.Tech III Year I Semester (R09) Regular and Supplementary Examinations, November 2012

**MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS**

(Common to CE, BT, ME, EEE, ECC and MCT)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 Define demand. Explain various factors determine demand for a commodity.

2 Explain with examples:
(a) Price elasticity of demand.
(b) Cross elasticity of demand.

3 Explain how do you determine breakeven point in volume and value. Explain graphically.

4 Define market. Distinguish between perfect and imperfect markets.

5 (a) Discuss the factors affection the choice of from of business organization.
(b) Define partnership & explain its features and advantages.

6 (a) Define Capital Budgeting? Explain its importance.
(b) How is useful of Payback Period method? Explain its features and limitations.

7 Explain the following in briefly:
(a) Double entry system.
(b) Book – keeping.
(c) Capital.
(d) Income.

8 The following is the balance sheet of Sri Anurag Enterprises as on 31st Dec 20007.

| Liabilities | Rs | Assets | Rs. |
|---|---|---|---|
| Share capital | 2,00,000 | Buildings | 2,00,000 |
| Reserve fund | 50,000 | Machinery | 1,50,000 |
| Profit balance | 30,500 | Stock on hand | 1,00,000 |
| Bank loan | 1,50,000 | Sundry debtors | 60,000 |
| Sundry creditors | 70,000 | Cash on hand | 20,500 |
| Provision for Tax | 30,000 | | |
| | 5,30,000 | | 5,30,000 |

You are required to comment on Liquidity and Solvency position of the concern.

******

Code: 9AHS401

**3**

B.Tech III Year I Semester (R09) Regular and Supplementary Examinations, November 2012

**MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS**

(Common to CE, BT, ME, EEE, ECC and MCT)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 State and Explain the Law of demand .what are its exceptions?

2 Define elasticity of demand. Explain its types and significance.

3 What are Laws of Returns? Illustrate with reference to agriculture.

4 What are the main features of Monopoly? How does it differ from perfect competition?

5 (a) What are the characteristics of a Business Unit?
(b) Explain the features of sole traders' form of business organization.

6 (a) What are the factors determining the Working Capital requirements?
(b) Explain the importance and nature of Capital Budgeting.

7 (a) Define trading account. Explain its objectives and importance.
(b) Depreciation.
(c) Bad debts.

8 With the following information compute:
(a) Current Ratio.
(b) Quick Ratio.
(c) Stock Turnover Ratio.
(d) Gross Profit Ratio.

| | Rs. | | Rs. |
|---|---|---|---|
| Opening Stock | 1,00,000 | Cash on hand | 3,00,000 |
| Closing Stock | 2,00,000 | Debtors | 4,00,000 |
| Purchases | 5,45,000 | Sundry Creditors | 3,00,000 |
| Wages | 15,000 | Bills Payable | 2,50,000 |
| Administrative Expenses | 4,000 | Bank Credit | 2,50,000 |
| Selling and Distribution Expenses | 2,40,000 | | |
| Sales | 10,00,000 | | |

******

Code: 9AHS401

**4**

B.Tech III Year I Semester (R09) Regular and Supplementary Examinations, November 2012

**MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS**

(Common to CE, BT, ME, EEE, ECC and MCT)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 Define the law of demand. What are its exceptions? Explain.

2 What the methods of forecasting demand?

3 Write short notes on any two of the following:
(a) Internal economies.
(b) External economies.
(c) Production function.

4 Define market. Explain any four methods of pricing, based on strategy.

5 (a) Define partnership and explain its silent features and limitations**.**
(b) What are the qualities of a good partner?

6 (a) What are the limitations of Accounting Rate of Returns?
(b) How is Profitability Index of a project calculated? What are its advantages?

7 (a) How are Accounts finalized at the end of an Accounting period with the help of a Trial balance? Illustrate.
(b) Define financial statements, and explain its objectives and importance.

8 (a) How is Quick ratio different from current ratio? How are they helpful in evaluation?
(b) The Accounting data of a business unit is as follows.

| ***Liabilities*** | Rs. | ***Assets*** | Rs. |
|---|---|---|---|
| Share capital | 11,00,000 | Plant and machinery | 15,00,000 |
| Mortgage loans | 11,50,000 | Amounts receivable | 12,00,000 |
| Contingent liabilities | 6,50,000 | Stock on hand | 2,00,000 |
| | 29,00,000 | | 29,00,000 |

Calculate:
(a) Current Ratio.
(b) Quick Ratio.

*****