

**MALLAREDDY COLLEGE OF ENGINEERING AND TECHNOLOGY, HYDERABAD**

**B.Tech II Year I Semester Examinations, Model Paper I -2018**

**Basic Mechanical Engineering**

**(Common to EEE, ECE, CSE, EIE, BME, IT, MCT, ETM, ECOMPE)**

**Time: 3 hours**

**Max. Marks: 70**

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**Note:** This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

**SECTION-1**

- 1      a) Explain air standard Otto cycle with PV and TS diagram and write its efficiency? (7M)  
       b) Discuss about entropy and available energy? (7M)

**(OR)**

- 2      a) Explain air standard Diesel cycle with PV and TS diagram and write its efficiency? (7M)  
       b) Explain the significance of Clausius inequality. (7M)

**SECTION-2**

- 3      a) With the help of neat sketch, explain the working of four stroke SI engine ? (7M)  
       b) With a suitable sketch explain the working of a gas turbine. (7M)

**(OR)**

- 4      a) Describe the working of reciprocating pump? (7M)  
       b) With a neat sketch explain the working of centrifugal pump. ( 7M)

### SECTION-3

5 a) Explain working of vapour compression refrigeration system with neat sketches? (7M)

b) What is mean by COP and Efficiency? (7M)  
( OR)

6 a) Explain about the different refrigerants used and their impact on the environment. (7M)

b) With the help of psychometric chart explain various psychometric processes. (7M)

### SECTION-4

7 a) How can you arrange gears for transmitting power from one shaft to another? (7M)

b) Discuss on CRDI and MPFI technology. (7M)

( OR)

8 a) Explain belt drives and types of belts used in belt drives? (7M)

b) Classify gears and gear trains? (7M)

### SECTION-5

9 a) Illustrate the working single plate clutch. (7M)

b) Write a short notes on (1). Forging. (2) Rolling. (7M)

( OR)

10 What is powder metallurgy? What are the basic steps of powder metallurgy? (14M)

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**Max. Marks: 70**

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**Note:** This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

**SECTION-1**

- 1 a) Explain two statements of second law of thermodynamics? (7M)  
b) Discuss about entropy and available energy? (7M)

(OR)

- 2 a) Explain about Carnot cycle with PV and TS diagram and write its efficiency? Write its limitations? (7M)  
b) Sketch a Brayton cycle and explain? (7M)

**SECTION-2**

- 3) a). Discuss about hydraulic turbines and gas turbines? (7M)  
b). Differentiate between fan, blowers and compressors. (7M)

(OR)

- 4) a) With the help of neat sketch, explain the working of four stroke SI engine (7M)  
b) With the help of neat sketch, explain the working of four stroke CI engine (7M)

### SECTION-3

5 a) .Explain the working of vapour compression refrigeration system. (7M)

b) Explain about the different refrigerants used and their impact on the environment. (7M)

(OR)

6 a) With the help of psychometric chart explain various psychometric processes. (7M)

b) Discuss about window air conditioning? (7M)

### SECTION-4

7 a) Classify gears and gear trains? (7M)

b) Illustrate the working principle in single plate clutch. (7M)

(OR)

8 What is powder metallurgy? What are the basic steps of powder metallurgy? (7M)

### SECTION-5

9 a) Explain different engineering materials with properties? (7M)

b) Explain sand casting and die casting? (7M)

(OR)

10 a) Explain sand casting and die casting? (7M)

b) With the help of neat sketch, explain Extrusion process? (7M)

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**Time: 3 hours**

**Max. Marks: 70**

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**Note:** This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

**SECTION-1**

- 1) Explain air standard Diesel cycle with PV and TS diagram and derive its efficiency

(OR)

- 2) Explain air standard Otto cycle with PV and TS diagram and derive its efficiency?

**SECTION-2**

- 3) Discuss about hydraulic turbines and gas turbines?

(OR)

- 4) .With the help of neat sketch, explain the working of four stroke CI engine

**SECTION-3**

- 5) Explain working of vapour compression refrigeration system with neat sketches?

(OR)

- 6) With the help of psychometric chart explain various psychometric processes

**SECTION-4**

- 7) How can you arrange gears for transmitting power from one shaft to another?

(OR)

- 8) Explain with neat sketches on (1). Forging. (2) Rolling processes.

**SECTION-5**

- 9) Explain different engineering materials with properties?

(OR)

- 10) With the help of neat sketches, explain rolling and Forging process?

**MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY**

(Autonomous Institution – UGC, Govt. of India)

**UG Model question paper  
ELECTRICAL MACHINES-I**

Time:3hours

Max Marks: 70

**Note:** This question of 5 sections. Answer five questions, choosing one question from each section and each question paper contains carries 14 marks.

**Section-I**

1. a) Describe the principle of energy conversion and apply it to an electric motor as electromechanical conversion device. [7M]
- b) All energy conversion devices use magnetic field as a coupling medium rather than electrical field. Explain why?. [7M]

OR

2. a) Draw and explain with block diagram, the various energies involved in an electro mechanical energy conversion device. [7M]
- b) Show that the reaction of coupling magnetic field on the electrical or mechanical system is essential for the electromechanical energy conversion process. (7M)

**Section-II**

3. a ) Explain the basic principle of operation of a D.C. generator (7M)
- b) With neat diagram give the constructional features of D.C. machine. (7M)

OR

4. a) Describe the constructional details of the armature of a D.C. machine giving suitable diagrams. (7M)
- b) Give the materials and functions of the following parts of a D.C. machine. (i) Field poles, (ii) Yoke, (iii) Commutator, (iv) Commutating poles and (v) Armature. (7M)

**Section-III**

5. a) Draw the schematic diagram of separately excited D.C. generator. Also write the current and voltage equations. (7M)
- b) Draw the schematic diagram of D.C. series generator. Also write the current and voltage equation. (7M)

OR

6. a) In a 110 V D.C. compound generator, the resistance of the armature, shunt field and series field are  $0.06\ \Omega$ ,  $25\ \Omega$  and  $0.04\ \Omega$  respectively. The load consists of 200 lamps each rated at 55 W, 110 V. Find the total e.m.f. generated and the armature current when the machine is connected in, (a) Long shunt and (b) Short shunt. (7M)

b) Draw the schematic diagram of D.C. short shunt generator and also write the current and voltage equation. (7M)

#### Section-IV

7. a) Write the principle of working of D.C. motor (7M)

b) A 250 V D.C. motor takes 41 amp at full load. Its armature and shunt field resistance are  $0.1\ \Omega$  and  $250\ \Omega$ . Find back e.m.f. on full load. (7M)

OR

8. a) Draw the schematic diagram of D.C. series motor. Also write the back e.m.f. current and voltage equations. (7M)

b) A D.C. series motor working on 200 V supply draws a current of 50 A, its armature and series field resistance are  $0.03\ \Omega$  and  $0.02\ \Omega$  respectively. Calculate back e.m.f. (7M)

#### Section-V

9. a) List the different methods of speed control of D.C. shunt motor.

b) In a Hopkinson's test on 220 V, 100 kW generators the circulating current is equal to the full load current and in addition, 90 A are taken from the supply. Obtain the efficiency of each machine.

OR

10. a) What is Swinburne's test? List the advantages and the disadvantages of Swinburne's test conducted on D.C. motor.

b) Write about Hopkinson's test and give its limitations. What are the advantages of Hopkinson's test?

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**UG Model question paper  
ELECTRICAL MACHINES-I**

Time:3hours

Max Marks: 70

**Note:** This question of 5 sections. Answer five questions, choosing one question from each section and each question paper contains carries 14 marks.

**Section-I**

1. a) Derive expression for the magnetic force developed in linear electromagnetic system. [7M]  
b) What is the expression for electromagnetic torque develop in a linear electromagnetic system? [7M]

OR

2. a) What is energy balance equation? Explain the importance of it in electromechanical energy conversion devices.. [7M]  
b Give applications of singly excited system and explain their working. (7M)

**Section-II**

3. a) Derive the EMF equation of a D.C. generator. [7M]  
b) An 8-pole D.C. generator has per pole flux of 40 m wb and winding is connected in lap with 960 conductors. Calculate the generated e.m.f. on open circuit when it runs at 400 r.p.m. If the armature if wave wound at what speed must the machine be driven to generate the same voltage. [7M]

OR

4. a) The armature of a 6-pole generator has a wave winding containing 664 conductors. Calculate the generated e.m.f. when flux per pole is 60 m wb and the speed is 250 r.p.m. Find the speed at which the armature must be driven to generate an e.m.f. of 550 V if the flux per pole is reduced to 58 m wb. (7M)  
b) Derive the expression for calculating the demagnetizing and cross magnetizing ampere turns per pole in a D.C. generator with usual notation.(7M)

**Section-III**

5. a) Draw the external and internal characteristics of a separately excited D.C. generator. (7M)  
b) What is critical speed? Explain the significance of critical speed(7M)



OR

6. a) In a 110 V compound generator, the resistance of the armature, shunt and series windings are 0.06, 25 and 0.04  $\Omega$  respectively. The load consists of 200 lamps each rated at 55 W, 110 V. Find the e.m.f. generated and armature current when the machine is connected, (a) Long shunt, (b) Short shunt and (c) How will the ampere-turns of series winding be changed if in, (i) A diverter of resistance 0.1  $\Omega$  be connected in parallel with the series winding? Ignore armature reaction and brush contact drop. (10M)
- b) What is the significance of residual magnetism? (4M)

#### Section-IV

7. a) In a 4-pole lap wound D.C. compound motor develops back e.m.f. of 200 V. The field produces a flux of 0.025 wb and the armature contains 400 conductors. Calculate the speed developed. (7M)
- b) Why is starter necessary for D.C. motor? (7M)

OR

8. a) Deduce the condition for maximum power for a D.C. motor. (7M)
- b) A 4-pole, 500 V, shunt motor has a total of 720 armature conductors which are wave wound. The full-load armature current is 60 A, and the flux per pole is 0.03 m wb. The armature resistance is 0.2  $\Omega$ . The voltage drop across a brush is 1 volt. Calculate the full-load speed of the motor. (7M)

#### Section-V

9. a) What are the different methods of speed control of a D.C. motor? Explain.? (7M)
- b) Explain with neat diagram, how can you find efficiency of small D.C. motor with brake test. (7M)
- OR
10. a) Describe a method of determining the efficiency of D.C. shunt motor at various loads, without actually putting the load on the motor. State the assumptions made in the method described. (7M)
- b) What do you mean by back-to-back test in case of D.C. shunt machines? What are the limitations of this test? (7M)

UG Model question paper  
ELECTRICAL MACHINES-I

Time:3hours

Max Marks: 70

**Note:** This question of 5 sections. Answer five questions, choosing one question from each section and each question paper contains carries 14 marks.

**Section-I**

1. a) With the help of neat diagram obtain the expression for the energy stored in a magnetic system for a simple attracted armature type relay. Explain the operation of system. (7M)  
b) Explain the mechanical energy and work done in singly excited system when actual displacement occurs. (7M) OR
2. a) Derive an expression for the mechanical force developed for singly excited magnetic field system. (7M)  
b) Define expressions of field energy and co-energy in a singly-excited electromechanical unit. (7M)

**Section-II**

3. a) What is armature reaction? Describe the effects of armature reaction on the operation of a D.C. machine. How the armature reaction is minimized? (7M)  
b) The armature of a 2-pole, 200 V generator has 400 conductors and runs at 300 r.p.m. Calculate the useful flux per pole. If the number of turns in each field coil is 1200, what is the average value of the e.m.f. induced in each coil on breaking the field, if the flux dies away completely in 0.1 (∅ = 0.1 wb

$$E_{ave} = 1200 V ) (7M)$$

OR

4. a) A 4-pole lap connected D.C. generator having 50 slots on its armature with 6 conductors per slot, the flux per pole 30 m wb and generates an open circuit voltage of 180 V (i) Find the speed at which the motor will run for the above condition, (ii) Keeping the speed constant, suggest a change in the armature of the generator such that the generator is capable to generate at no load a voltage of 90 V, with the same rated flux. (7M)  
b) What is the fundamental difference between a simple lap winding and a simplex wave winding? Draw simple diagrams to show the above windings. (7M)

### Section-III

5. a) What are the requirements of voltage build up in self-excited D.C. generator?. (7M)
- b) Draw the load characteristics of shunt, series and compound generators. Describe these characteristics nature and applications (7M)

OR

6. a) Mention the reasons for the compounding D.C. generator. Neatly sketch and explain the external characteristics of a D.C. compound generator. (7M)
- b) Distinguish between internal and external characteristic of a D.C. generator. How can the internal characteristic be derived from the external characteristic of a separately excited generator? (7M)

### Section-IV

7. a) Explain the principle of operation of a D.C. motor. Derive the equation for the torque developed by a D.C. motor. (7M)
- b) A 12-pole lap connected 230 V shunt motor has 410 conductors. It takes 41 A on full-load. The flux per pole is 0.05 wb. The armature and field resistances are  $0.1\ \Omega$  and  $230\ \Omega$  respectively. Contact drop per brush is 1 V. Determine the speed of motor at full load. (7M)

OR

8. a) Why the e.m.f. induced in D.C. motor is called as back e.m.f. and then explains principle of operation of D.C. motor? (7M)
- b) Define Torque. Derive the expression for torque developed by a D.C. motor from fundamentals.(7M)

### Section-V

9. a) How can you conduct the retardation test on D.C. shunt motors? (7M)
- b) Describe any one laboratory test procedure to separate the losses in a D.C. machine. (7M)

OR

10. a) Explain how rotational losses can be estimated using retardation test (7M)
- b) What are the various methods of speed control of D.C. series motors? (7M)

# **ELECTRO MAGNETIC FIELDS QUESTION BANK**

**B.TECH  
(II YEAR – I SEM)  
(2018-19)**

**Prepared by:**

**K.Mallikarjuna Lingam., Assoc.Prof**

**Department of Electrical & Electronics Engineering**



**MALLA REDDY COLLEGE  
OF ENGINEERING & TECHNOLOGY**

**(Autonomous Institution – UGC, Govt. of India)**

Recognized under 2(f) and 12 (B) of UGC ACT 1956

(Affiliated to JNTUH, Hyderabad, Approved by AICTE - Accredited by NBA & NAAC – 'A' Grade - ISO 9001:2015 Certified)  
Maisammaguda, Dhulapally (Post Via. Kompally), Secunderabad – 500100, Telangana State, India

**(R17A0205)ELECTRO MAGNETIC FIELDS**

Objectives:

1. To introduce the concepts of electric field, magnetic field.
2. Applications of electric and magnetic fields in the development of the theory for power transmission lines and electrical machines.

UNIT – I Electrostatics: Electrostatic Fields – Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge – Work done in moving a point charge in an electrostatic field – Electric Potential – Properties of potential function – Potential gradient – Gauss's law – Application of Gauss's Law – Maxwell's first law,  $\text{div}(\mathbf{D}) = \rho_v$  – Laplace's and Poisson's equations – Solution of Laplace's equation in one variable. Electric dipole – Dipole moment – potential and EFI due to an electric dipole – Torque on an Electric dipole in an electric field – Behavior of conductors in an electric field – Conductors and Insulators

UNIT – II Dielectrics & Capacitance: Behavior of conductors in an electric field – Conductors and Insulators – Electric field inside a dielectric material – polarization – Dielectric – Conductor and Dielectric – Dielectric boundary conditions – Capacitance – Capacitance of parallel plates – spherical co-axial capacitors with composite dielectrics – Energy stored and energy density in a static electric field – Current density – conduction and Convection current densities – Ohm's law in point form – Equation of continuity

UNIT – III Magneto Statics: Static magnetic fields – Biot-Savart's law – Magnetic field intensity (MFI) – MFI due to a straight current carrying filament – MFI due to circular, square and solenoid current Carrying wire – Relation between magnetic flux and magnetic flux density – Maxwell's second Equation,  $\text{div}(\mathbf{B}) = 0$ , Ampere's Law & Applications: Ampere's circuital law and its applications viz. MFI due to an infinite sheet of current and a long current carrying filament – Point form of Ampere's circuital law – Maxwell's third equation,  $\text{Curl}(\mathbf{H}) = \mathbf{J}_c$

UNIT – IV Force in Magnetic fields and Magnetic Potential: Magnetic force Moving charges in a Magnetic field – Lorentz force equation – force on a current element in a magnetic field – Force on a straight and a long current carrying conductor in a magnetic field – Force between two straight long and parallel current carrying conductors – Magnetic dipole and dipole moment – a differential current loop as a magnetic dipole – Torque on a current loop placed in a magnetic field. Scalar Magnetic potential and its limitations – vector magnetic potential and its properties – vector magnetic potential due to simple configurations –vector Poisson's equations. Self and Mutual inductance – Neumann's formulae – determination of self-inductance of a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same

plane – energy stored and density in a magnetic field. Introduction to permanent magnets, their characteristics and applications.

UNIT – V Time Varying Fields: Time varying fields – Faraday's laws of electromagnetic induction – Its integral and point forms – Maxwell's fourth equation,  $\text{Curl } (\mathbf{E}) = -d\mathbf{B}/dt$  – Statically and Dynamically induced EMFs – Simple problems -Modification of Maxwell's equations for time varying fields – Displacement current

**TEXT BOOKS:**

1. "William H. Hayt & John. A. Buck", "Engineering Electromagnetics", Mc. Graw-Hill Companies, 7th Edition, 2009.
2. "Sadiku", "Electromagnetic Fields", Oxford Publications, 4th Edition, 2009.

**REFERENCE BOOKS:**

1. "CR Paul and S. A. Nasar", "Introduction to Electromagnetic", Mc-Graw Hill Publications, 3rd Edition, 1997.
2. "Nathan Ida", "Engineering Electromagnetic", Springer (India) Pvt. Ltd. 2nd Edition, 2015.
3. "D J Griffiths", "Introduction to Electro Dynamics", Prentice-Hall of India Pvt. Ltd, 3rd edition, 1999.
4. "J. D Kraus", "Electromagnetics", Mc Graw-Hill Inc. 4th edition, 1992.

Course Outcomes: upon completion of course, student will be able to Apply vector calculus to static electric – magnetic fields.

1. Compute the force, fields & Energy for different charge & current configurations & evaluate capacitance and inductance.
2. Analyze Maxwell's equation in different forms (Differential and integral) in Electrostatic, Magnetic time varying fields.
3. Ability to solve the problems in different EM fields.
4. Ability to Analyse moving charges on Magnetic fields.
5. Ability to Solve Electromagnetic Relation using Maxwell Formulae.

Code No: 133AP

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B.Tech II Year I Semester Examinations, November/December - 2017****ELECTROMAGNETIC FIELDS****(Electrical and Electronics Engineering)****Time: 3 Hours****Max. Marks: 75****Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

**PART- A****(25 Marks)**

- 1.a) What is Maxwell's First Law? [2]
- b) Derive the relationship between potential and electric field intensity. [3]
- c) Justify that electric field is conservative. [2]
- d) Define current density. Write the relation between current and current density. [3]
- e) What is the fundamental difference between static electric and magnetic field lines? [2]
- f) A long straight wire carries a current  $I = 1$  amp. At what distance is the magnetic field  $H = 1$  A/m. [3]
- g) Mention the limitations of scalar magnetic potential. [2]
- h) A solenoid has an inductance of 20 mH. If the length of the solenoid is increased by two times and the radius is decreased to half of its original value, find the new inductance. [3]
- i) What is the significance of displacement current? [2]
- j) Derive Maxwell's equation derived from Ampere's law. [3]

**PART-B****(50 Marks)**

- 2.a) If  $V = 2x^2y + 20z - (4/(x^2 + y^2))$  Volts, Find  $E$  and  $D$  at P (6, -2.5, 3). [5+5]
  - b) Derive Laplace and Poisson equation. [5+5]
- OR**
- 3.a) A circular disc of radius 'a' m is charged uniformly with a charge density of  $\sigma$  C/m<sup>2</sup>. Find the electric field at a point 'h' m from the disc along its axis.
  - b) What is an electric dipole? Obtain expression for torque experienced by an electric dipole in a uniform electric field. [5+5]
- 4.a) Show the expression of the capacitance for a spherical capacitor consists of 2 concentric spheres of radius 'a' & 'b' also obtain the capacitance for an isolated sphere.
  - b) Find the capacitance of a conducting sphere of 2 cm in diameter, covered with a layer of polyethylene with  $\epsilon_r = 2.26$  and 3 cm thick. [5+5]
- OR**
- 5.a) Derive an expression for capacitance of co-axial cable.
  - b) In a material for which  $\sigma = 5.0$  S/m and  $\epsilon_r = 1$ , the electric field intensity is  $E = 250 \sin 1010t$  (V/m). Find the conduction and displacement current densities. [5+5]

- 6.a) Using Biot-Savart's law, find the magnetic field intensity on the axis of a circular loop with radius  $R$  and carrying a steady current  $I$ .  
 b) Find the magnetic field intensity at the centre of square loop of side  $5\text{m}$  carrying  $10\text{A}$  of current. [5+5]

**OR**

- 7.a) State Ampere's circuital law and explain any two applications of Ampere's circuital law.  
 b) Derive the equation to show that curl of magnetic field intensity is equal to current density. [5+5]

- 8.a) Show that the force between two parallel conductors carrying current in the same direction is attractive.  
 b) A magnetic field,  $B = 3.5 \times 10^{-2} \hat{a}_z$  Tesla, exerts a force on a  $0.3\text{m}$  conductor along the  $x$ -axis. If the conductor current is  $5\text{ A}$  in the  $-A_x$  direction, what force must be applied to hold the conductor in position. [5+5]

**OR**

- 9.a) Derive the expression for self inductance of a coaxial cable of inner radius ' $a$ ' and outer radius ' $b$ '.  
 b) Determine the inductance of a solenoid of  $2500$  turns wound uniformly over a length of  $0.25\text{m}$  on a cylindrical paper tube,  $4\text{ cm}$  in diameter and the medium is air. [5+5]

- 10.a) Write Maxwell's equations in integral form for time varying Fields.  
 b) Generalize Ampere's law for time varying fields. [5+5]

**OR**

- 11.a) State and explain Faraday's laws of electromagnetic induction.  
 b) In a material for which  $\sigma = 5.0\text{ s/m}$  and  $\epsilon_r = 1$ , the electric field intensity is  $E = 250 \sin 1010t$  (V/m). Find the conduction and displacement current densities, and the frequency at which they have equal magnitudes. [5+5]

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**Code No: 123BY****JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B.Tech II Year I Semester Examinations, November/December - 2016****ELECTROMAGNETIC FIELDS****(Electrical and Electronics Engineering)****Time: 3 Hours****Max. Marks: 75****Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

**PART- A****(25 Marks)**

- 1.a) Write the properties of potential function. [2]
- b) What is Maxwell's first law? [3]
- c) Define electric dipole. [2]
- d) Define Convection and conduction current densities. [3]
- e) Define Magnetic field intensity. [2]
- f) Write the applications of Ampere's circuital law. [3]
- g) Write the vector Poisson's equation. [2]
- h) What are the applications of permanent magnets? [3]
- i) Define time varying fields. [2]
- j) How dynamically induced EMF is produced? [3]

**PART-B****(50 Marks)**

- 2.a) State and prove Gauss's law as applied to an electric field and determine the field due to an infinite line charge.
- b) Derive Poisson's and Laplace equations starting from point form of Gauss Law. [5+5]

**OR**

- 3.a) Show that the electric field intensity at any point inside a hollow charged Spherical conductor is zero.
- b) Three point charges each 5 nC are located on the x-axis at points: -1, 0 and + 1 m in free space. (i) Find E at x=5. (ii) Determine the value and location of the equivalent single point charge that would produce the same field at very large distance. [5+5]
- 4.a) Establish the electrostatic boundary conditions for the tangential components of electric field and electric displacement at the boundary of two non dielectrics.
- b) The relative permittivity of dielectric in a parallel plate capacitor varies linearly from 4 to 8. If the distance of separation of plates is 1 cm and area of cross-section of plates is 12 cm<sup>2</sup>, find the capacitance. Derive the formula used. [5+5]

**OR**

- 5.a) A spherical capacitor with inner sphere of radius 1.5 cm and outer sphere of radius 3.8 cm has an homogeneous dielectric of  $\epsilon = 10 \epsilon_0$ . Calculate the capacitance of the capacitor. Derive the formula used.
- b) Prove that the derivative of the energy stored in an electrostatic field with respect to volume is  $\frac{1}{2} D \cdot E$ , where D and E electric flux density and electric field intensity respectively. [5+5]

- 6.a) State and explain Biot-Savart's law and derive the expression for the magnetic field at a point due to an infinitely long conductor carrying current.  
b) What are the limitations of Amperes current law? How this law can be modified to time varying field? [5+5]

**OR**

- 7.a) Derive Maxwell's second equation  $\text{div}(\mathbf{B})=0$ .  
b) Derive magnetic field intensity due to a square current carrying element. [5+5]
- 8.a) Derive the Neumann's formulae for the calculation of self and mutual inductances.  
b) Explain the concept of vector magnetic potentials. [5+5]

**OR**

- 9.a) Determine the inductance of a toroid,  
b) A rectangular coil of area  $10 \text{ cm}^2$  carrying a current of 50 A lies on plane  $2x + 6y - 3z = 7$  such that the magnetic moment of the coil is directed away from the origin. Calculate its magnetic moment. [5+5]
- 10.a) Explain concept of displacement current and obtain an expression for the displacement current density.  
b) Explain in detail about modification of Maxwell's equations for time varying fields. [5+5]

**OR**

- 11.a) Explain Faraday's laws of electromagnetic induction and derive the expression for induced EMF.  
b) Derive Maxwell's equations in integral form for time varying Fields. [5+5]

Code No: 123BY

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B. Tech II Year I Semester Examinations, March - 2017****ELECTROMAGNETIC FIELDS****(Electrical and Electronics Engineering)****Time: 3 Hours****Max. Marks: 75**

**Note:** This question paper contains two parts A and B.  
Part A is compulsory which carries 25 marks. Answer all questions in Part A.  
Part B consists of 5 Units. Answer any one full question from each unit.  
Each question carries 10 marks and may have a, b, c as sub questions.

**PART-A****(25 Marks)**

- 1.a) State coulomb's law of electric charges? [2]
- b) Derive an expression for field due to a hollow conducting sphere. [3]
- c) Obtain Ohm's law in point form. [2]
- d) Define electric dipole and dipole moment? [3]
- e) State Biot-Savart's law. [2]
- f) Derive an expression for MFI due to a straight current carrying filament. Use ampere circuital law. [3]
- g) What are the applications of permanent magnets? [2]
- h) Define self-inductance and Mutual inductance. [3]
- i) State Faraday's laws of electromagnetic induction. [2]
- j) Deduce an expression for Maxwell's fourth equation. [3]

**PART-B****(50 Marks)**

- 2.a) Find the electric Field at a point (1,-2, 1) m, if the potential is  $V = 3x^2y + 2yz^2 + 2xyz$ . [5+5]
  - b) Derive the expression for EFI due to a sheet of charge. [5+5]
- OR**
- 3.a) State and Explain the Gauss's law. [5+5]
  - b) Derive an expression for electric field intensity in different region of a coaxial cable. Use Gauss Law. [5+5]

- 4.a) Derive an expression for Capacitance of Spherical Capacitor. [5+5]
- b) Obtain boundary conditions between Conductor and Dielectric interface. [5+5]

**OR**

- 5.a) What is the behavior of conductors in an electric field? [5+5]
- b) Deduce the expression for potential due to an electric dipole? [5+5]

- 6.a) Prove  $\text{div}(\mathbf{B})=0$ . [5+5]
- b) Derive an expression for MFI due to square current carrying wire at its centre. [5+5]

**OR**

- 7.a) Obtain MFI due to a infinite sheet of surface current density  $K \bar{a}_z$ . [5+5]
- b) Discuss point form of Ampere's circuital law. [5+5]

- 8.a) Obtain the expression for the inductance of a toroidal ring.  
b) A coil of 500 turns is wound in a closed iron ring of mean radius of 10cm and cross section area of  $3\text{cm}^2$ . Find the self inductance of the winding if the relative permeability of iron is 800? [5+5]

OR

- 9.a) Derive the Expressions for Scalar and Vector magnetic potentials.  
b) Derive the expression for mutual inductance between a long straight wire and rectangular loop lying in the same plane. [5+5]

- 10.a) State and Explain Faraday's laws of electromagnetic induction in integral and point forms.  
b) A square coil with a loop area  $0.01\text{ m}^2$  and 50 turns is rotated about its axis at right angle to a uniform magnetic field  $B = 1\text{ T}$ . Calculate the instantaneous value of emf induced in the coil when its plane is:  
i) at right angle to the field  
ii) in the plane of the field  
iii) when the plane of coil is  $45^\circ$  to the field. [5+5]

OR

- 11.a) In a material for which  $\sigma = 4.5\text{ V/m}$  and  $\epsilon_r = 1$ , the electric field intensity is  $E = 300 \sin 10^9 t \text{ V/m}$ . Determine the conduction and displacement current densities and the frequency at which they have equal magnitude?  
b) Derive an expression for Displacement current. [5+5]

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**Code No: 113BY****JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B. Tech II Year I Semester Examinations, November/December - 2017****ELECTROMAGNETIC FIELDS****(Electrical and Electronics Engineering)****Time: 3 Hours****Max. Marks: 75****Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

**PART- A****(25 Marks)**

- 1.a) What are the properties of potential function? [2]
- b) What are the limitations of Coulomb's law? [3]
- c) Define dipole and dipole moment. [2]
- d) What is the capacitance of a parallel plate capacitor when the stored energy is  $5 \mu\text{J}$  and the voltage across the plates is  $5 \text{ V}$ ? [3]
- e) What are the limitations of Ampere's circuital law? [2]
- f) State Biot-Savart's law. [3]
- g) What is the significance of Lorentz force equation in magnetic fields? [2]
- h) A solenoid with air core has 2000 turns and a length of 500 mm. Core radius is 40 mm. Find its inductance. [3]
- i) Write the Maxwell's equations in integral form for time varying fields. [2]
- j) What is meant by statically induced e.m.f? [3]

**PART-B****(50 Marks)**

- 2.a) Derive the expression for electric field intensity due to line charge.
- b) Four concentrated charges  $Q_1 = 0.3 \mu\text{C}$ ,  $Q_2 = 0.2 \mu\text{C}$ ,  $Q_3 = -0.3 \mu\text{C}$ ,  $Q_4 = 0.2 \mu\text{C}$  are located at the vertices of a plane rectangle. The length of rectangle is 5 cm and breadth of the rectangle is 2 cm. Find the magnitude and direction of resultant force on  $Q_1$ . [5+5]

**OR**

- 3.a) Explain the Laplace and Poisson's equations for electrostatic fields.
- b) Using Gauss law, derive an expression for electric field intensity at any point inside and outside of a sphere of radius 'a' due to a uniform spherical charge distribution of volume charge density of ' $\rho$ '. [5+5]

- 4.a) Derive the expression for energy stored and energy density in static electric field.
- b) A parallel plate capacitor consists of two square metal plates of side 500 mm and separated by a 10 mm slab of Teflon with  $\epsilon_r = 2$  and 6 mm thickness is placed on the lower plate leaving an air gap of 4mm thick between it and upper plate. If 100 V is applied across the capacitor, find D, in Teflon and air. [5+5]

**OR**

- 5.a) State and prove the conditions on the tangential and normal components of electric flux density and electric field intensity, at the boundary between the dielectrics.
- b) A square parallel plate capacitor 200 mm on side with a plate spacing of 25 mm is filled with a dielectric slab ( $\epsilon_r = 240$  of the same dimensions if 100 V is applied to the capacitor) Find: (i) the polarization P in the dielectric and (ii) the energy stored by the capacitor. [5+5]

- 6.a) State Biot-Savart's law for magnetic field B due to a steady line current in free space.
- b) Derive an expression for magnetic field intensity due to infinite sheet of current. [5+5]

**OR**

- 7.a) A steady current of 10 A is established in a long straight hollow aluminum conductor having inner and outer radius of 1.5 cm and 3 cm respectively. Find the value of B as function of radius.
- b) Derive an expression for the magnetic field strength at the center of a square loop of side 'a' meters and N turns. [5+5]

- 8.a) Derive point form of Ampere's circuital law.
- b) Two infinitely long parallel conductors are separated by a distance 'd'. Find the force per unit length exerted by one of the conductor on the other if the currents in the two conductors are  $I_1$  and  $I_2$ . [5+5]

**OR**

- 9.a) Derive the expression for inductance of a solenoid.
- b) A single-phase circuit comprises two parallel conductors A and B, each 1 cm diameter and spaced 1 meter apart. The conductors carry currents of +100 and -100 amperes respectively. Determine the magnetic field intensity at the surface of each conductor and also exactly midway between A and B. [5+5]

- 10.a) A conductor with cross sectional area of  $10 \text{ cm}^2$  carries a conduction current of  $0.2 \sin(109t) \text{ mA}$ . Given that  $\sigma = 2.5 \times 10^6 \text{ S/m}$  and  $\epsilon_r = 6$ , calculate the magnitude of the displacement current density.
- b) Derive the Maxwell's equations in point and integral form for time varying fields. [5+5]

**OR**

- 11.a) Explain the concept of displacement current and obtain an expression for the displacement current density.
- b) Derive Maxwell's fourth equation,  $\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$ . [5+5]

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**Code No: 113BY****JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B.Tech II Year I Semester Examinations, March - 2017****ELECTROMAGNETIC FIELDS****(Electrical and Electronics Engineering)****Time: 3 Hours****Max. Marks: 75****Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

**PART-A****(25 Marks)**

- 1.a) State the expression for the force between one charge point to an array of a charge points? [2]
- b) State and explain Gauss's law. [3]
- c) Give ohms law in point form. [2]
- d) Brief about the concept of Polarization in materials. [3]
- e) Define Ampere's circuital law and its applications. [2]
- f) Obtain Maxwell's second equation. [3]
- g) Derive Expression for Vector Magnetic Potential. [2]
- h) Write the applications of Permanent Magnets. [3]
- i) State Faraday's law of Electromagnetic induction. [2]
- j) What is displacement current? Explain. [3]

**PART-B****(50 Marks)**

2. Deduce the Expression for  $\vec{E}$  due to a electric dipole? A field is given in spherical co-ordinate system P ( $r=5$ ,  $\theta = 30^\circ$ ,  $\Phi=60^\circ$ ) as  $\vec{E} = (20\vec{a}_r - 30\vec{a}_\theta + 60\vec{a}_\phi)$  v/m. Find the incremental work done in moving a  $10 \mu\text{C}$  charge through a distance of  $0.8 \mu\text{m}$  in the direction of a)  $\vec{a}_r$  b)  $\vec{a}_\theta$  c)  $\vec{a}_\phi$ . [10]

**OR**

3. Prove the Expression  $\vec{E} = -\nabla V$ ? Where E is the Electric Field Intensity and V is the scalar Potential? A uniform line of charge  $\rho_l = 2.5 \mu\text{C/m}$  lies along the z-axis and a circular cylinder of radius 3m has a surface charge density of  $\rho_s = -0.12 \mu\text{C/m}^2$ , Both the distributions are infinite in extent with respect to z-axis. Using Gauss's law. Find  $\vec{D}$  in all regions. The region is free space? [10]

4. Derive the Expressions for the Boundary conditions between two perfect dielectrics. [10]

**OR**

5. Prove that the convection current density is linearly proportional to the charge density and the velocity with which the charge is transferred. [10]

6.a) The Magnetic Field Intensity  $\vec{H}$  due to a infinite current carrying sheet, Assume a current  $\vec{k}$  in xz-plane, Prove that,  $\vec{H} = \frac{k_y}{2} \vec{a}_{n_y}$ .

b) Find the Magnetic Field Intensity  $\vec{H}$  at a point p(0.01, 0, 0)m, if the current through a co-axial cable is 6A, which is along z-axis and a= 3mm, b = 9mm, c = 11mm? [5+5]

**OR**

7. By using Ampere circuital law, derive the Expression for Magnetic Field Intensity  $\vec{H}$  due to a infinite long current carrying conductor. Find the Magnetic field Intensity at a radius of 0.5m from a long straight line conductor carries a current of 2A/m. [10]

8. Derive the expressions for coefficient of coupling and equivalent inductance for various connections of magnetic circuits? If a coil of 800μH is magnetically coupled to another coil of 200μH. The Coefficient of coupling between two coils is 0.05 Calculate the inductance, if two coils are connected in a) series aiding b) series opposition c) parallel aiding and d) parallel opposing. [10]

**OR**

9. Derive the Expressions for Scalar and Vector magnetic potentials. Derive the Expressions for Laplace's and Poisson's equation for magnetic field. [10]

10. Derive the Maxwell's Equations for Time Varying Fields. [10]

**OR**

11.a) A conductor of length 100cm moves at right angles to uniform field of strength 10000 lines per cm<sup>2</sup>, with a velocity of 50 m/s. Calculate e.m.f. induced it when the conductor moves at a angle 30° to the direction of field?

b) An a.c voltage source  $\mathcal{E}(t) = V_0 \sin \omega t$  is connected across a parallel plate capacitor of capacitance 'C'. Show that the displacement current in the capacitor is the same as the conduction current in the wires. [5+5]

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**Code No: 113BY****JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B.Tech II Year I Semester Examinations, February/March - 2016****ELECTROMAGNETIC FIELDS****(Electrical and Electronics Engineering)****Time: 3 Hours****Max. Marks: 75****Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

**PART- A****(25 Marks)**

- 1.a) What do mean by Electrostatic field and how can you say it is conservative. [2]
- b) Determine the force between two charges  $3 \times 10^{-4} \text{ C}$  at P (1, 2, 3) and  $-10^{-4} \text{ C}$  at Q (2, 0, 5) in vacuum. [3]
- c) Distinguish between conductors and dielectrics. [2]
- d) What is the capacitance of a capacitor consisting of two Parallel plates  $30\text{cm} \times 30\text{cm}$  separated by 5 mm on air. [3]
- e) State Biot-Savarts law. [2]
- f) Derive Maxwell's third equation. [3]
- g) Write about Lorentz force equation. [2]
- h) A Toroid has air core and has a cross-sectional area of  $10\text{mm}^2$ . It has 1000 turns and its mean radius is 10mm. Find its inductance. [3]
- i) What is meant by the term displacement current? [2]
- j) Explain how maxwell's equations are modified for time varying electric and magnetic fields. [3]

**PART- B****(50 Marks)**

- 2.a) Determine the potential a (0,0,4) m caused by a total charge  $10^{-8} \text{ C}$  distributed uniformly along a disc of radius 4m lying in the  $z=0$  plane and centered at origin.
- b) Define work done and electric potential. Show that the electric field intensity is negative gradient of potential. [5+5]

**OR**

- 3.a) Find the value of electric field intensity at any point along the axis of a uniformly charged disc.
- b) State Gauss law and mention few applications of it. [5+5]
- 4.a) What is an electric dipole and dipole moment? Derive an expression for torque experienced by an electric dipole.
- b) A parallel plate capacitor has conducting plates of area equal to  $0.04\text{m}^2$ . The plates are separated by a dielectric material whose  $\epsilon_r = 2$  with the plate separation of 1cm. Find its capacitance value. [5+5]

**OR**

- 5.a) Derive the boundary conditions of two dielectric media.
- b) Explain about equation of continuity in electrostatic fields. [5+5]

- 6.a) Using ampere's circuital law, find MFI due to an infinite sheet of current.  
b) What is the magnetic field,  $H$  in Cartesian coordinates due to  $z$ - directed current element? Find  $\mathbf{J}$  if  $I=2A$ . [5+5]

**OR**

- 7.a) What is meant by Curl? Give its significance.  
b) A steady current of  $I$  amperes flow in a circular bent in the form of square loop of side 'a'. Find the MFI ( $H$ ) at the center of the loop. [4+6]

- 8.a) Find the force between two straight long and parallel current carrying conductors in the same and opposite directions.  
b) Explain the concept of scalar and vector magnetic potentials. [6+4]

**OR**

- 9.a) Find the inductance of Solenoid.  
b) Derive the expression for energy stored and energy density in a magnetic field. [4+6]

10. Write Maxwell's equations in point form and explain physical significance of the equations. [10]

**OR**

- 11.a) State and explain the Faraday's laws in electromagnetic induction.  
b) Explain statically and dynamically induced e.m.fs. [10]

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**MALLAREDDY COLLEGE OF ENGINEERING AND TECHNOLOGY, HYDERABAD****B.Tech II Year I Semester Examinations, Model Paper I -2018****Electronic Devices and Circuits****(Common to EEE, ECE, CSE, EIE, BME, IT, MCT, ETM, ECOMPE)****Time: 3 hours****Max. Marks: 70**

**Note:** This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

**SECTION-I**

1. (a) Draw the V-I characteristics of a diode with zero cut-in voltage and equivalent resistance of  $100\Omega$ . Draw the load line if  $R_L$  is also  $100\Omega$ . [7]  
(b) Explain V-I characteristics of pn junction Diode. [7]  
(OR)
2. Explain the constructional and principal operations of SCR and PHOTO diode. [14]

**SECTION-II**

3. Draw and explain the circuit diagram of full-wave rectifier with inductor filter. Derive the Ripple factor equation. [14]  
(OR)
4. Derive expressions for ripple factor, regulation and rectification efficiency of a Center tapped Transformer Full wave rectifier. [14]

**SECTION-III**

5. (a) Explain different current components in a transistor. [7]  
(b) Explain how Transistor acts as an Amplifier [7]  
(OR)
6. Draw the circuit diagram of Common Emitter amplifier using accurate h-parameter model. Derive expressions for  $A_v$ ,  $A_i$ ,  $R_i$  &  $R_o$ . [14]

**SECTION-IV**

7. What are the compensation techniques used for  $V_{BE}$  and  $I_{CO}$ ? Explain with the help of suitable circuits [14]  
(OR)
8. (a) Design a collector to base bias circuit using silicon transistor to achieve a stability factor of 20, with the following specifications:  $V_{CC}=16V$ ,  $V_{BE}=0.7V$ ,  $V_{CEQ}=8V$ ,  $I_{CQ}=4mA$  &  $\beta=50$  [7]  
(b) Derive condition for thermal stability? [7]

### SECTION-V

9. (a) With the help of neat sketches and characteristic curves explain the construction & operation of a JFET and mark the regions of operation on the characteristics. [7]  
(b) Derive expression for transconductance in a field effect transistor. [7]
- (OR)
10. (a) Explain the construction and principle of operation of Depletion type N-channel MOSFET [7]  
(b) Compare BJT and FET [7]

**MALLAREDDY COLLEGE OF ENGINEERING AND TECHNOLOGY, HYDERABAD****B.Tech II Year I Semester Examinations, Model Paper II -2018****Electronic Devices and Circuits****(Common to EEE, ECE, CSE, EIE, BME, IT, MCT, ETM, ECOMPE)****Time: 3 hours****Max. Marks: 70**

**Note:** This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

**SECTION-I**

1. (a) Explain the effect of temperature on V-I characteristics of a diode. [7]
- (b) Distinguish between drift and diffusion current in a semiconductor. [7]

**(OR)**

2. Explain the working of Tunnel diode with help of energy band diagrams and Draw V-I Characteristics [14]

**SECTION-II**

3. (a) A Full wave single phase rectifier makes use of 2 diodes, the internal forward resistance of each is considered to be constant and equal to  $30\Omega$ . The load resistance is  $1K\Omega$ . The transformer secondary voltage is 200-0-200V (rms). Calculate  $V_{DC}$ ,  $I_{DC}$ , Ripple factor [7]
- (b) A Zener voltage regulator circuit is to maintain constant voltage at 60 V, over a current range from 5 to 50 mA. The input supply voltage is 200 V. Determine the value of resistance R to be connected in the circuit, for voltage regulation from load current  $I_L = 0$  mA to  $I_L$  max, the maximum possible value of  $I_L$ . What is the value  $I_L$  max? [7]

**(OR)**

4. Derive expression for FWR Rectifier i) DC load current ii) DC output voltage iii) Peak Inverse Voltage of each diode IV) Efficiency v) Ripple factor [14]

**SECTION-III**

5. (a) Compare the three transistor amplifier configurations with related to  $A_v$ ,  $A_i$ ,  $R_i$  &  $R_o$  [7].
- (b) For the emitter follower with  $R_s = 0.5K$ ,  $R_L = 50K$ ,  $h_{fe} = -50$ ,  $h_{re} = 1K$ ,  $h_{oe} = 25\mu A/V$ ,  $h_{re} =$   
1. Calculate  $A_v$ ,  $A_i$ ,  $Z_i$  and  $Z_o$  [7]

**(OR)**

- 6.(a) Draw the circuit diagram of a transistor in CB configuration and explain the output characteristics with the help of different regions. [7]
- (b) Calculate the collector current and emitter current for a transistor with  $\alpha_{D.C.} = 0.99$  and  
I  $I_{CBO} = 50 \mu A$  when the base current is  $20\mu A$ . [7]

#### SECTION-IV

7. Draw a Fixed bias circuit & explain its operation. Calculate the Stability factor  $S$  &  $S'$ . [14]  
(OR)
8. Define stability factors for a BJT with Self biasing method. Suggest how this method to effects on operating point of a BJT circuit [14]

#### SECTION-V

9. (a) Sketch the drain characteristics of MOSFET for different values of  $V_{GS}$  & mark different regions of operation. [7]  
(b) Give the construction details of JFET and explain its operation. [7]  
(OR)
10. (a) Write short notes on applications of FET as a voltage variable resistor. [7]  
(b) Explain the principle of CS FET amplifier with the help of circuit diagram. Derive the expressions for  $A_v$ , input impedance and output impedance [7]

**MALLAREDDY COLLEGE OF ENGINEERING AND TECHNOLOGY, HYDERABAD****B.Tech II Year I Semester Examinations, Model Paper III -2018****Electronic Devices and Circuits****(Common to EEE, ECE, CSE, EIE, BME, IT, MCT, ETM, ECOMPE)****Time: 3 hours****Max. Marks: 70**

**Note:** This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

**SECTION-I**

1. Explain in detail, the reason for exponential rise in forward characteristic of a diode with suitable mathematical expression. [14]

(OR)

- 2) a) Explain the construction and working principal of photo diode. [7]  
b) Draw the equivalent circuits of diode [7]

**SECTION-II**

3. Draw the circuit diagram of a Full wave bridge rectifier. Explain the operation of circuit with relevant waveforms [14]

(OR)

- 4 a) Compare the performance of Inductor filter and capacitor filter. [7]  
b) Explain Full wave rectifier with neat diagram? [7]

**SECTION-III**

5. (a) Define the hybrid parameters for a basic transistor circuit and give CE hybrid model. Explain input and output characteristics of C.E Configuration [14]

(OR)

6. (a) Summarise the salient features of the characteristics of BJT operatives in CE, CB and CC configurations? [7]  
(b) Calculate the collector current and emitter current for a transistor with  $\alpha_{D.C.} = 0.99$  and  $I_{CBO} = 20 \mu A$  when the base current is  $50 \mu A$ . [7]

**SECTION-IV**

7. Draw a Collector feedback bias circuit and explain its operation. Calculate the Stability factor S [14]

(OR)

8. (a) What is a load line? Explain its significance. [7]  
(b) Find the Q-point of self-bias transistor circuit with the following specifications:  $V_{CC} = 22.5V$ ,  $R_L = 5.6k\Omega$ ,  $R_C = 1k\Omega$ ,  $R_I = 90k\Omega$ ,  $R_2 = 10k\Omega$ ,  $V_{BE} = 0.7V$  and  $\beta = 55$ . Assume  $I_B \gg I_{CO}$ . [7]

## SECTION-V

- 9(a) Bring out comparison between JFET and MOSFET. [7]  
(b) Draw the circuit's diagram of common drain amplifier and derive expression for voltage gain [7]

(OR)

10. (a) Compare Depletion MOSFET and enhancement MOSFET [7]  
(b) Explain in detail about generalized FET amplifier [7]



**MALLAREDDY COLLEGE OF ENGINEERING AND TECHNOLOGY, HYDERABAD****B.Tech II Year I Semester Examinations, Model Paper IV -2018****Electronic Devices and Circuits****(Common to EEE, ECE, CSE, EIE, BME, IT, MCT, ETM, ECOMPE)****Time: 3 hours****Max. Marks: 70**

**Note:** This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

**SECTION-I**

1. (a) Explain the V-I characteristics of Zener diode and distinguish between Avalanche and Zener Break downs. [7]  
(b) In a Zener diode regulator, the supply voltage = 300V,  $V_z = 220V$ ,  $I_z = 15mA$  and load current = 25mA. Calculate the value of resistor required to be connected in series with the Zener diode. [7]  
(OR)
2. Draw the basic structure of Varactor diode and explain its operation and V-I Characteristics. [14]

**SECTION-II**

3. A 230 V, 60Hz voltage is applied to the primary of a 5:1 step down, center tapped transformer used in a full wave rectifier having a load of  $900\Omega$ . If the diode resistance and the secondary coil resistance together has a resistance of  $100\Omega$ , determine  
i) Dc voltage across the load. ii) Dc current flowing through the load.  
iii) Dc power delivered to the load. iv) PIV across each diode. [14]  
(OR)
4. (a) Design ripple factor of LC filter for a Full wave rectifier [7]  
(b) In a full-wave rectifier using an LC – filter  $L=10mH$ ,  $C=100\mu F$  and  $R_L = 500\Omega$ . Calculate  $I_{DC}$ ,  $V_{DC}$  for an input  $V_i=300\sin(100t)$  [7]

**SECTION-III**

5. (a) Draw the circuit diagram of a transistor in CB configuration and explain the output characteristics with the help of different regions. [7]  
(b) In a germanium transistor collector current is 51mA, when base current is 0.4mA. If  $h_{fe} = \beta_{dc} = 125$ , Calculate cut off current,  $I_{CEO}$ . [7]  
(OR)
6. (a) Explain the input and output characteristics of a transistor in CC configuration [7]  
(b) Calculate the values of  $I_E$ ,  $\alpha_{dc}$  and  $\beta_{dc}$  for a transistor with  $I_B=13\mu A$ ,  $I_C=200mA$ ,  $I_{CBO}=6\mu A$ . Also determine the new level of  $I_C$  which will result from reducing  $I_B$  to 100mA [7]

#### SECTION-IV

7. Draw a Self bias circuit and explain its operation. Calculate the Stability factor  $S, S^I, S^{II}$  [14]

(OR)

- 8 (a) what is a load line? Explain its significance. [7]  
(b) Find the Q-point of self-bias transistor circuit with the following specifications:  $V_{CC}=22.5V$ ,  $R_L=5.6k\Omega$ ,  $R_C=1k\Omega$ ,  $R_I=90k\Omega$ ,  $R_2=10k\Omega$ ,  $V_{BE}=0.7V$  and  $\beta=55$  [7]

#### SECTION-V

- 9) The field effect transistor is called a voltage-sensitive electronic control device. Explain why is the case? [7]  
b) Define the circuit parameters of the JFET. How are they related to each other? [7]

(OR)

- 10.(a) Explain the construction and principle of operation of Enhancement mode N-channel MOSFET. [7]  
b) Compare BJT & FET. [7]

**MALLAREDDY COLLEGE OF ENGINEERING AND TECHNOLOGY, HYDERABAD**  
**B.Tech II Year I Semester Examinations, Model Paper V -2018**

**Electronic Devices and Circuits**

(Common to EEE, ECE, CSE, EIE, BME, IT, MCT, ETM, ECOMPE)

**PART-A**

**Time: 3 hours**

**Max. Marks: 70**

**Note:** This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

**SECTION-I**

1. (a) Explain and Derive expression for transition capacitance? [7]  
(b) Find the value of D.C. resistance and A.C resistance of a Germanium junction diode at  $25^{\circ}\text{C}$  with reverse saturation current,  $I_o = 25\mu\text{A}$  and at an applied voltage of 0.2V across the diode. [7]  
(OR)
2. With neat energy band diagrams, explain the V-I characteristics of Tunnel diode in detail. Also explain the negative-resistance region in the characteristics and applications of Tunnel diode. [14]

**SECTION-II**

3. Draw the circuit diagram of full-wave rectifier with inductor filter. Explain its operation with necessary equations. [14]  
(OR)
4. Derive the expression for the ripple factor of  $\pi$ -Section filter when used with a Full-wave-rectifier. Make necessary approximations. [14]

**SECTION-III**

- 5.(a) Based on the currents flowing through a BJT illustrate the amplification process. [7]  
(b) Compare CB, CC, and CE configurations [7]  
(OR)
6. Draw the circuit diagram, AC equivalent & small signal equivalent of Common Emitter amplifier using accurate h-parameter model. Derive expressions for  $A_v$ ,  $A_i$ ,  $R_i$  &  $R_o$ . [14]

**SECTION-IV**

7. Explain the basic requirements of transistor biasing. Verify these requirements in collector to base bias circuit. [14]  
(OR)
8. Design a fixed bias circuit using silicon transistor, with the following specifications:  $V_{CC} = 16\text{V}$ ,  $V_{BE} = 0.7\text{V}$ ,  $V_{CEQ} = 8\text{V}$ ,  $I_{CQ} = 4\text{mA}$  &  $\beta = 50$ . [14]

### SECTION-V

9. (a) A self biased P-channel JFET has a pinch-off voltage of  $V_P=5V$  and  $I_{DSS}=12mA$  .the supply voltage is  $12V$  .Determine the values of  $R_D$  and  $R_S$  so that  $I_D=5ma$  and  $V_{DS}=6V$ [7]  
(b) List the advantages and disadvantages of FET over MOSFET [7]  
(OR)
10. (a) Explain self biasing of Common source JFET [7]  
(b) Explain the significance of threshold voltage of an E-MOSFET. [7]

# MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

### B.Tech II year – I Semester Examinations, Model Paper-1

#### Electronic Devices and Circuits

Time: 3 hours

Max. Marks: 70

**Note:** This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

#### SECTION-I

1. (a) At room temperature, the diode current is 0.8 mA when the applied voltage is 400 mV, and diode current is 20 mA when the applied voltage is 500 mV. Determine the value of  $\eta$ . [7M]  
(b) Explain the effect of temperature on the diode characteristics. [7M]  
OR
2. Explain the tunnel diode with an energy band diagram. [7M]

#### SECTION-II

- 3 (a) A 230V 60Hz voltage is applied to the primary of a 5:1 step down center tapped transformer used in a full wave rectifier having a load of 900  $\Omega$ . If the diode resistance and the secondary coil resistance together has a resistance of 100  $\Omega$ , determine [7M]  
(i) DC voltage across the load  
(ii) DC current flowing through the load  
(iii) PIV across each diode  
(b) Explain the operation of full Wave Rectifier with Capacitor Filter [7M]  
OR
4. A full wave rectifier is operated from 50 Hz supply with 120 V (r.m.s.). It is connected to a load drawing 50mA current and using 100 $\mu$ F filter capacitor. Calculate the DC output voltage and r.m.s. value of ripple voltage. Also calculate the ripple factor. [7M]  
(b) Draw the circuit diagram of half wave type rectifier and explain its operation. [7M].

#### SECTION-III

5. Explain the input and output characteristics of a transistor in CE configuration. [7M]

OR

- 6 (a) Explain what is meant by early effect? What are its consequences? [7M]  
(b) A CE transistor amplifier circuit has the source resistance of 100  $\Omega$ , load resistance  $R_L=10$  K  $\Omega$ ,  $h_{ie}=1$  K  $\Omega$ ,  $h_{fe}=50$ ,  $h_{re}=2.5 \times 10^{-4}$ , and  $h_{oe}=25 \times 10^{-6}$  A/V. calculate input resistance, output resistance voltage, current and power gain. [7M]

#### SECTION-IV

7. A silicon transistor is used in voltage divider bias arrangement with  $V_{CC}=16$  V, and  $R_C=1.5$  K  $\Omega$ . The operating point is chosen to be  $V_{EC}=8$  V, and  $I_C=4$  mA. A stability factor  $S=12$  is desired When  $\beta=50$ . Find  $R_1$ ,  $R_2$  and  $R_E$ . [7M]  
(b) What is Thermal runaway? How it can be avoided [7M]

OR

8. What is biasing? With neat circuit diagram, explain the self biasing method and derive the expression for its stability factor. [7M]

#### SECTION-V

9. (a) Explain the operation of n-channel JFET. Why the name field effect is used for the device? [7]  
(b) Define the pinch-off voltage. Mark pinch-off locus from drain characteristics. [7].  
OR
10. (a) Explain the operation of a n-channel MOSFET in depletion mode. [7]  
(b) Explain the operation of a n-channel MOSFET in enhancement mode. [7]

**MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**  
**B.Tech II year – I Semester Examinations, Model Paper-1**  
**Electronic Devices and Circuits**

**Time: 3 hours**

**Max. Marks: 70**

**Note:** This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

**SECTION-I**

1. (a) The reverse saturation current of a silicon diode is  $50 \mu\text{A}$  at room temperature. Find the forward diode current at  $40^\circ\text{C}$  and a forward voltage of  $0.3\text{V}$  [7]

(b) What is P-N junction diode? How potential barrier is formed in a P-N junction diode? [7]

OR

2.(a) Explain Avalanche and Zener breakdowns in PN junction diode. [7]

(b) Explain the working principle of Tunnel diode. [7]

**SECTION-II**

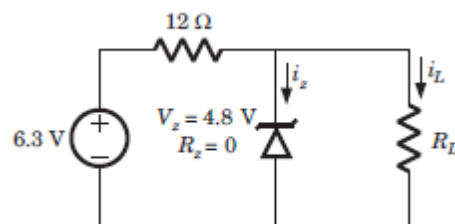
3. (a) Derive the ripple factor expression of a full wave rectifier with capacitor filter [7]

(b) A sinusoidal voltage of magnitude  $V_m = 24\text{ V}$  is applied to a half wave rectifier. The diode may be considered to be ideal and  $R_L = 1.8\text{K}\Omega$  is connected as load. Find Peak value of current, RMS value of current, DC value of current and ripple factor. [7]

OR

4.(a) Explain the operation of Full wave rectifier with necessary graphs. [7]

(b) In the voltage regulator circuit shown below, the Zener diode current is to be limited to the range  $5 \leq i_z \leq 100\text{ mA}$ . Find the range of load current and load resistance. [7]



**SECTION-III**

5. (a) A transistor with  $\alpha = 0.985$  has a reverse saturation current of  $2\mu\text{A}$  in C.B. configuration. Calculate the value of leakage current in the C.E. configuration. Also find out the collector current and emitter current if the base current is  $25\mu\text{A}$ . [7]

(b). How the Transistor acts as an amplifier. [7]

OR

6. (a) For the emitter follower, with source resistance  $100\Omega$ , load resistance  $R_L = 5\text{ K}\Omega$ ,  $h_{ic} = 1\text{ K}\Omega$ ,  $h_{fc} = -51$ ,  $h_{rc} = 1$ , and  $h_{oc} = 25 \times 10^{-6}\text{ A/V}$ . calculate input resistance, output resistance voltage and current gain. [7]

(b) Draw and explain the output characteristics of BJT in common base configuration. [7]

**SECTION-IV**

7. (a) A Silicon transistor uses voltage divider bias method with  $\beta = 100$ ,  $V_{CC} = 12 \text{ V}$ ,  $R_C = 4 \text{ K}\Omega$ ,  $R_1 = 10 \text{ K}\Omega$  and  $R_2 = 100 \text{ K}\Omega$  and  $R_E = 3 \text{ K}\Omega$ ,  $V_{BE} = 0.6 \text{ V}$ . Determine the operating point and stability factor.

[7]

(b) What do you understand by DC and AC load lines?

[7]

OR

8. (a) Draw the circuit diagram of a self bias circuit of CE amplifier and derive the expression for stability factor.

[5]

(b) In a silicon transistor circuit with fixed bias  $V_{CC} = 9 \text{ V}$ ,  $R_C = 3 \text{ K}\Omega$ ,  $R_B = 40 \text{ K}\Omega$ ,  $\beta = 50$ ,  $V_{BE} = 0.7 \text{ V}$ . Find the operating point and stability factor.

[7]

### **SECTION-V**

9. (a) Draw and Explain the operation of depletion type MOSFET.

[7]

(b) Why FET is called voltage variable resistor (VVR).

[7]

OR

10. (a) Define the three FET parameters:  $g_m$ ,  $r_d$  and  $\mu$ . Prove that  $\mu = g_m \times r_d$ .

[7]

(b) Explain the transfer characteristics of n-channel JFET.

[7]

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**MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**MODEL QUESTION PAPER-1**

**Name of the Subject: MATHEMATICS - III**

**TIME: 3hours**

**Max Marks: 75**

**Note:** This question paper contains two parts A and B.

Part A compulsory which carries is 25 marks. Answer all questions in Part A.

Part B contains of 5 units. Answer any one full question from each unit. Each Question carries 10 marks and may have a, b, c as sub questions.

**PART-A (25 Marks)**

1. a. Define Beta function.
- b. S.T.  $\Gamma(\frac{1}{2}) = \sqrt{\pi}$
- c. Write Rodrigue's Formula.
- d. Prove That  $J_{-n}(x) = (-1)^n \cdot J_n(x)$ , where  $n \in \mathbb{Z}^+$ .
- e. Define Complex Potential Function, Velocity Potential Function and Stream Function.
- f. State Cauchy's Theorem.
- g. State Maclaurin's Series.
- h. Find the Residue of  $\frac{ze^z}{(z-1)^3}$  at its Pole.
- i. Write Standard Transformations.
- j. Find the Fixed Points of the Transformation (i).  $w = \frac{2i-6z}{iz-3}$  (ii).  $w = \frac{z-1}{z+1}$ .

**PART-B (50 Marks)**

2. a. Find  $\int_0^{\pi/2} \sin^5 \theta \cos^{7/2} \theta d\theta$
- b. To show  $\beta(m, n) = \int_0^\infty \frac{x^{n-1}}{(1+x)^{m+n}} dx$

OR

3. S.T.  $\int_0^1 \frac{x^2 dx}{\sqrt{1-x^4}} \times \int_0^1 \frac{dx}{\sqrt{1-x^4}} = \pi/4$
4. a. If  $f(x) = \begin{cases} 0, & \text{if } -1 < x < 0 \\ 1, & \text{if } 0 < x < 1 \end{cases}$

Then Show That  $f(x) = \frac{1}{2}P_0(x) + \frac{3}{4}P_1(x) - \frac{7}{16}P_3(x) + \dots$ .



b. Prove That  $(2n + 1)xP_n(x) = (n + 1)P_{n+1}(x) + nP_{n-1}(x)$ .

OR

5. a. Show That  $J_4(x) = \left(\frac{48}{x^3} - \frac{8}{x}\right)J_1(x) + \left(1 - \frac{24}{x^2}\right)J_0(x)$ .

b. Show That  $J_n(x)$  is an even function when  $n$  is even & odd function when  $n$  is odd.

6. a. If  $f(z) = u + iv$  is analytic in a domain  $D$  and  $uv$  is constant in  $D$ , then

Prove That  $f(z)$  is Constant.

b. If  $w = \Phi + i\psi$  represents the Complex Potential for an Electric Field and

$\psi = x^2 - y^2 + \frac{x}{x^2 + y^2}$ , Determine  $\Phi$ .

OR

7. a. Evaluate  $\int_C \frac{z^3 + z^2 + z + 1}{(z-1)^3} dz$  where  $c$  is  $|z| = 3$ .

b. Evaluate  $\int_C \frac{z^4}{(z+1)(z-i)^2} dz$  where  $c$  is the Ellipse  $9x^2 + 4y^2 = 36$ .

8. State and Prove Taylor's Theorem of Complex Function  $f(z)$

OR

9. a. Evaluate  $\int_C \frac{4-3z}{z(z-1)(z-2)} dz$  where  $c$  is  $|z| = \frac{3}{2}$  using Residue Theorem.

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

10. a. Show That the image of the Hyperbola  $x^2 - y^2 = 1$  under the

Transformation  $w = \frac{1}{z}$  is the Lemniscates  $\rho^2 = \cos 2\Phi$ .

b. Find the image of the infinite strip  $0 < y < \frac{1}{2}$  under the mapping function  $w = \frac{1}{z}$ .

OR

11. Find the Bilinear Transformation which maps the points  $(2, i, -2)$  into the points  $(1, i, -1)$ .

**MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**MODEL QUESTION PAPER-2**

**Name of the Subject: MATHEMATICS - III**

**TIME: 3 hours**

**Max Marks: 75**

**Note:** This question paper contains two parts A and B.

Part A compulsory which carries is 25 marks. Answer all questions in Part A.

Part B contains of 5 units. Answer any one full question from each unit. Each Question carries 10 marks and may have a, b, c as sub questions.

**PART-A (25 Marks)**

1.
  - a. Define Gamma function.
  - b. Prove that  $\beta(m, n) = \beta(m+1, n) + \beta(m, n+1)$
  - c. Write Orthogonality of Legendre's Polynomials
  - d. Write the Relation between  $J_{-n}(x)$  and  $J_n(x)$  where  $n \in \mathbb{Z}^+$ .
  - e. Define Harmonic Function and Show That  $u = e^x \cos y$  is Harmonic
  - f. Evaluate  $\int_C \frac{z^2 - z + 1}{(z-1)} dz$ , where  $c: |z| = \frac{1}{2}$ .
  - g. Find Taylor's Series of  $\sin z$  about  $z = \frac{\pi}{4}$ .
  - h. Define Removable, Essential and Pole Singularities.
  - i. Find the image of the Circle  $|z - 1| = 1$  under the mapping  $w = \frac{1}{z}$ .
  - j. Define Critical Point and Bilinear Transformation.

**PART-B (50 Marks)**

2. P.T.  $\beta(m, n) = \frac{\overline{\binom{m}{n}} \cdot \overline{\binom{n}{m}}}{\overline{\binom{m+n}{m}}}$  where  $m > 0, n > 0$

OR

3. a. P.T.  $\beta(m, n) = 2 \int_0^{\pi/2} \sin^{2m-1} \theta \cos^{2n-1} \theta d\theta$ .

b. P.T.  $2^{2n-1} \overline{\binom{n}{n}} \overline{\left(n + \frac{1}{2}\right)} = \overline{\binom{2n}{n}} \cdot \sqrt{\pi}$

4. a. Prove That  $\frac{1+z}{z\sqrt{1-2xz+z^2}} - \frac{1}{z} = \sum_{n=0}^{\infty} [P_n(x) + P_{n+1}(x)]z^n$ .

b.  $P_n^1(-1) = (-1)^{n-1} \cdot \frac{n(n+1)}{2}$

OR

5. a. Express  $J_2(x)$  in terms of  $J_0(x)$  and  $J_1(x)$ .  
b. Prove That  $\frac{d}{dx}[xJ_n(x)J_{n+1}(x)] = x[J_n^2(x) - J_{n+1}^2(x)]$
6. a. If  $f(z) = u + iv$  is an analytic function of  $z$  and  $u - v = e^x(\cos y - \sin y)$ ,  
find  $f(z)$  in terms of  $z$ .  
b. Find  $k$  such that  $f(x, y) = x^3 + 3kxy^2$  is Harmonic and find its Conjugate.

OR

7. a. State and Prove Cauchy's Integral Formula.  
b. Evaluate  $\int_0^{1+i} (x^2 - iy) dz$  along (i).  $y = x$ , (ii).  $y = x^2$
8. State and Prove Laurent's Theorem.

OR

9. Evaluate  $\int_{-\infty}^{\infty} \frac{x^2 - x + 2}{x^4 + 10x^2 + 9} dx$ .
10. Show That Every Bilinear Transformation maps the Circles in the  $z$ -plane onto the Circles in the  $w$ -plane.

OR

11. Find the Bilinear Transformation which maps the points  $z = -1, i, 1$  into  $w = 0, i, \infty$ .

**MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**MODEL QUESTION PAPER-3**

**Name of the Subject: MATHEMATICS - III**

**TIME: 3 hours**

**Max Marks: 75**

**Note:** This question paper contains two parts A and B.

Part A compulsory which carries is 25 marks. Answer all questions in Part A.

Part B contains of 5 units. Answer any one full question from each unit. Each Question carries 10 marks and may have a, b, c as sub questions.

**PART-A (25 Marks)**

1.
  - a. Show that Beta function satisfying symmetry property.
  - b. Find  $\int_0^2 x(8-x)^{\frac{1}{3}} dx$
  - c. Write Orthogonality of Bessel Functions.
  - d. Find the value of  $x^3$  in terms of Legendre Polynomials.
  - e. Find the value of k such that  $f(z) = e^x(\cos y + i \sin y)$  is analytic.
  - f. Find the value of  $\int_{(0,0)}^{(1,1)} x^2 y dx + (x^2 - y^2) dy$  along the line  $y = 3x$ .
  - g. Show That  $(1+z)^{-1} = \sum_{n=0}^{\infty} (-1)^n z^{-n-1}$ , if  $|z| > 1$ .
  - h. Define Residue at a Pole and Residue at Infinity.
  - i. Write Cross-Ratio of four points  $z_1, z_2, z_3, z_4$ .
  - j. Find the image of the line  $x = 4$  in  $z$ -plane under the transformation  $w = z^2$

**PART-B (50 Marks)**

2.
  - a. S.T.  $\int_0^{\infty} e^{-x^2} dx = \frac{\sqrt{\pi}}{2}$
  - b. If m and n are +ve integers, then  $\beta(m, n) = \frac{(m-1)!(n-1)!}{(m+n-1)!}$

OR

3.
  - a. S.T.  $\overline{\Gamma(n)} = \int_0^1 \left( \log \frac{1}{x} \right)^{n-1} dx, n > 0$
  - b. S.T.  $\beta(m, n) = \int_0^1 \frac{x^{m-1} + x^{n-1}}{(1+x)^{m+n}} dx$
4.
  - a. Prove That  $\int_{-1}^1 x P_n(x) P_{n-1}(x) dx = \frac{2n}{4n^2-1}$

b. Prove That  $(1 - x^2)P_n'(x) = (n + 1)[xP_n(x) - P_{n+1}(x)]$ .

OR

5. a. Prove That  $\frac{d}{dx}[x^{-n}J_n(x)] = -x^{-n}J_{n+1}(x)$ .

b. Show That  $\cos(x \sin \theta) = J_0 + 2(J_2 \cos 2\theta + J_4 \cos 4\theta + \dots)$ .

6. a. Find the analytic function whose real part is  $e^{2x}(x \cos 2y - y \sin 2y)$ .

b. Show That  $f(z) = z + 2\bar{z}$  is not analytic anywhere in the complex plane.

OR

7. a. State and Prove Cauchy's Integral Theorem.

b. Evaluate  $\int_0^{1+i} [x^2 + 2xy + i(y^2 - x)] dz$  along  $y = x^2$ .

8. a. Find the Laurent's Series of  $\frac{1}{z^2 - 4z + 3}$  for  $1 < |z| < 3$ .

b. Find the Taylor's Series of  $e^z$  about  $z = 3$ .

OR

9. a. Find the Residue at  $z = 0$  of the function  $f(z) = \frac{1+e^z}{\sin z + z \cos z}$ .

b. Evaluate  $\int_C \frac{z-3}{z^2+2z+5} dz$ , where  $C$  is the Circle given by

(i).  $|z| = 1$ , (ii).  $|z + 1 - i| = 2$ , (iii).  $|z + 1 + i| = 2$ .

10. a. Find the image of  $|z| = 2$  under the transformation  $w = 3z$ .

b. Under the Transformation  $w = \frac{1}{z}$  find the image of the Circle  $|z - 2i| = 2$ .

OR

11. Find the Bilinear Transformation that maps the points  $(\infty, i, 0)$  into the points  $(0, i, \infty)$ .

**MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**MODEL QUESTION PAPER-4**

**Name of the Subject: MATHEMATICS - III**

**TIME: 3hours**

**Max Marks: 75**

**Note:** This question paper contains two parts A and B.

Part A compulsory which carries is 25 marks. Answer all questions in Part A.

Part B contains of 5 units. Answer any one full question from each unit. Each Question carries 10 marks and may have a, b, c as sub questions.

**PART-A (25 Marks)**

1.
  - a. Find  $\int_0^1 \frac{x dx}{\sqrt{1-x^5}}$  in terms of Beta and Gamma.
  - b. Find  $\int_0^{\pi/2} \sin^m \theta \cos^n \theta d\theta$
  - c. If  $P_4(x) = k(x^4 - \frac{30}{35}x^2 + \frac{3}{x})$ , then find k.
  - d. Evaluate  $\int J_3(x)$ .
  - e. Write C-R equations in Cartesian and Polar Forms.
  - f. State Cauchy's Integral Formula.
  - g. State Laurent's Series.
  - h. Find Zeros and Poles of  $\left(\frac{z+1}{z^2+1}\right)^2$ .
  - i. Define Conformal Mapping.
  - j. S.T. Bilinear Transformation is Conformal.

**PART-B (50 Marks)**

2.
  - a. P.T.  $\int_0^1 x^m (\log x)^n dx = \frac{(-1)^n n!}{(m+1)^{n+1}}$
  - b. P.T.  $\int_b^a (x-b)^{m-1} (a-x)^{n-1} dx = (a-b)^{m+n-1} \beta(m, n)$

OR

3.
  - a. S.T.  $\int_0^{\pi/2} \sin^2 \theta \cos^4 \theta d\theta = \frac{\pi}{32}$
  - b. P.T.  $\Gamma(n)\Gamma(1-n) = \frac{\pi}{\sin n\pi}$ .

4. a. S.T  $\int_{-1}^1 x^2 P_{n+1}(x) P_{n-1}(x) dx = \frac{2n(n+1)}{(2n-1)(2n+1)(2n+3)}.$

b. Express  $x^3 + 2x^2 - x - 3$  in terms of Legendre polynomials.

OR

5. a. Prove That  $xJ_n'(x) = -nJ_n(x) + xJ_{n-1}(x).$

b. Write  $J_{5/2}(x)$  in finite form.

6. a. Find analytical function whose real part is  $r^2 \cos 2\theta + r \sin 2\theta.$

b. If  $f(z)$  is an analytic function of  $z$ , Prove That  $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |f(z)|^2 = 4|f'(z)|^2.$

OR

7. a. Evaluate  $\int_C \frac{z^2 - z + 1}{z - 1} dz$ , where  $c: |z| = \frac{1}{2}.$

b. Evaluate  $\int_C \frac{\log z}{(z-1)^3} dz$ , where  $c: |z - 1| = \frac{1}{2}$  using Cauchy's Integral Formula.

8. a. Expand  $\frac{7z-2}{(z+1)z(z-2)}$  about the point  $z = -1$  in the region  $1 < |z + 1| < 3$

as Laurent's Series

b. Expand  $f(z) = \cos z$  in Taylor's Series about  $z = \frac{\pi}{4}.$

OR

9. a. State and Prove Cauchy's Residue Theorem

b. Evaluate  $\int_{-\infty}^{\infty} \frac{x^2}{(1+x^2)(x^2+4)} dx.$

10. a. Show That the function  $w = \frac{4}{z}$  Transforms the line  $x = c$  in the  $z$ - plane into a Circle in the  $w$ - plane.

b. Under the Transformation  $w = \frac{z-i}{1-iz}$  find the image of the Circle

(i).  $|w| = 1$ , (ii).  $|z| = 1.$

OR

11. Find the Bilinear Transformation which maps  $1 + i, -i, 2 - i$  of the  $z$ - plane into the points  $0, 1, i$  respectively of the  $w$ -plane. Find the Fixed and Critical Points of this Transformation.

**MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**MODEL QUESTION PAPER-5**

**Name of the Subject: MATHEMATICS - III**

**TIME: 3hours**

**Max Marks: 75**

**Note:** This question paper contains two parts A and B.

Part A compulsory which carries is 25 marks. Answer all questions in Part A.

Part B contains of 5 units. Answer any one full question from each unit. Each Question carries 10 marks and may have a, b, c as sub questions.

**PART-A (25 Marks)**

1.
  - a. S.T.  $\Gamma(1) = 1$
  - b. Find  $\int_0^{\infty} e^{-4x} x^{3/2} dx$
  - c. Write the values of  $J_{1/2}(x)$ ,  $J_{-1/2}(x)$ .
  - d. Show That  $P_n(1) = 1$ ,  $P_n(-1) = (-1)^n$ .
  - e. Define Analytic Function and Entire Function.
  - f. Evaluate  $\int_C \frac{dz}{(z^2+4)^2}$  , where  $c: |z - i| = 2$ .
  - g. State Taylor's Series.
  - h. Determine the Poles of the function (i).  $\frac{z}{\cos z}$  (ii).  $\cot z$ .
  - i. State Conformal Mapping Theorem.
  - j. Find the Critical Points of (i).  $w = z + \frac{1}{z}$  (ii).  $w = \cos z$ .

**PART-B (50 Marks)**

2.
  - a. Find  $\int_0^3 \frac{dx}{\sqrt{9-x^2}}$
  - b. Show that  $\int_a^b (x-a)^m (b-x)^n dx = (b-a)^{m+n+1} \beta(m+1, n+1)$

OR

3. P.T.  $\int_0^{\pi/2} \sqrt{\cos x} dx \times \int_0^{\pi/2} \frac{dx}{\sqrt{\cos x}} = \pi$ .



4. a. State and Prove Rodrigue's Formula.

b. S.T.  $x^3 = \frac{2}{5}P_3(x) + \frac{3}{5}P_1(x)$ .

OR

5. State and Prove Generating Function for  $J_n(x)$ .

6. Show That the function is defined by  $f(z) = \frac{x^3(1+i)-y^3(1-i)}{x^2+y^2}$  at  $z \neq 0$ , and  $f(0) = 0$  is continuous and satisfies C-R equations at the origin but  $f'(0)$  does not exist.

OR

7. a. Evaluate  $\oint \frac{z-1}{(z+1)^2(z-2)} dz$  where  $c: |z-i| = 2$  by Cauchy's Integral Formula.

b. Evaluate  $\int_C \frac{z+4}{z^2+2z+5} dz$ , where  $c: |z+1-i| = 2$ .

8. a. Define (i) Removable singularity, (ii) Essential singularity, (iii) Pole Singularity.

b. Find the Laurent's Series of  $f(z) = \frac{z^2-6z-1}{(z-1)(z-3)(z+2)}$  in the region  $3 < |z+2| < 5$ .

OR

9. a. Evaluate by Residue Theorem  $\int_C \frac{z-1}{(z+1)^2(z-2)} dz$ , where  $c: |z-i| = 2$ .

b. Evaluate  $\int_0^{2\pi} \frac{d\theta}{5-3\cos\theta}$  by Contour Integration.

10. State and Prove Conformal Mapping Theorem.

OR

11. a. Find the Fixed Points of the Transformation.

(i).  $w = \frac{2i-6z}{iz-3}$  (ii).  $w = \frac{6z-9}{z}$  (iii).  $w = \frac{z-1}{z+1}$  (iv).  $w = \frac{2z-5}{z+4}$ .

b. Define Bilinear Transformation and Show That Every Bilinear Transformation is Conformal.

**MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY**  
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UG Model question paper  
**Managerial Economics and Financial Analysis**

Time: 3 hours

Max Marks: 70

Note: This question of 5 sections. Answer five questions, choosing one question from each section and each question paper contains carries 14 marks.

**Section-I**

1. a) what is managerial economics? Discuss the nature & Scope of Managerial economics [7M]
- b) What is demand forecasting? Explain various factors involved in demand forecasting. [7M]

OR

2. a) Explain Law of Demand with its exceptions [7M]
- b) Distinguish between Micro and Macroeconomic concepts (7M)

**Section-II**

3. a) Define Production function. How can a producer find it useful? Illustrate. (4M)
- b) Define Cost. Explain the different cost concepts used in the process of Cost Analysis. (7M)
- c) Explain about cob Douglas production function (3M)

OR

4. a) Discuss about the economies and diseconomies of scale. (7M)
- b) Calculate the BEP in units and rupees using the following details: • Selling price per unit Rs. 100 • Variable cost per unit Rs. 60 • Fixed costs Rs. 20,000 • Actual sales Rs. 2, 00,000 (7M)

**Section-III**

5. a) Define Market. Explain the structure of market with suitable examples. (7M)
- b) Define partnership. Explain its features and evaluate it as against sole proprietorship (7M)

OR

6. a) what is price? Explain different methods of Pricing. (7M)
- b) Explain the need for public enterprises in India. Do you think Public Enterprises as a whole have fulfilled that need? (7M)

## Section-IV

7. a) What are the accounting concepts that govern accounting process? Explain in brief. (7M)

b) Explain the main sources have long term finance.

OR

8. a) Explain the factors affecting the requirements of working capital.

b) Explain about cash and capital budget.

## Section-V

9. a) what is capital budgeting ? Explain methods of capital budgeting?

b) What is ratio analysis? Explain different types of ratio analysis

OR

10. a) Ram Enterprise is considering purchasing a CNC machine. The following are the earnings after tax from the two alternative proposal under consideration each costing Rs 8,00,000. Select the better proposal if the company wishes to operate @ 10% rate of return.

	Year 1	Year 2	Year 3	Year 4	Year 5
Proposal I	80,000	2,40,000	3,20,000	4,80,000	3,20,000
Proposal 2	2,40,000	3,20,000	4,00,000	2,40,000	1,60,000
Present value of Rs 1 @10%	0.909	0.826	0.751	0.683	0.620

b) What do you mean by capital budgeting? Explain its significance.

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**Section-I**

1. a) With the help of a diagram, show the Demand curve and explain why it slopes downwards. [7M]  
b) Explain the quantitative methods used in Demand forecasting.. [7M]

**OR**

2. a) Explain the basic economic tools in managerial economics. [7M]  
b) Explain the different types of elasticity of demand. (7M)

**Section-II**

3. a) Explain the concepts of cost and explain their contribution to managerial decisions. [7M]  
b) What is contribution? Explain its significance in cost-volume profit analysis. [7M]

**OR**

4. a) what is BEA? Explain its managerial significance. (7M)  
b) From the following particulars Find out Selling price Rs.200 per unit Variable cost Rs.100 per unit Total Fixed cost Rs.96,000 i) Break Even Units and Value. ii) Sales to earn a profit of Rs.20,000 [7M]

**Section-III**

5. a) Define Oligopoly markets? What are the features of an Oligopoly Markets With Suitable examples? (7M)  
b) Explain in detail the Sole proprietary form of business organization?

**OR**

6. a) List out the Different pricing methods? Explain any three pricing methods..

- b) Explain the need for public enterprises in India. Do you think Public Enterprises as a whole have fulfilled that need?

### Section-IV

7. a) Distinguish between double entry and single entry system of Accounting.

b) write the formats for trading and profit & loss account.

**OR**

8. a) Explain the components of working capital. (7M)

b) Who are the users of financial statements and for what purpose do they use. (7M)

### Section-V

9. a) Enumerate the features of capital budgeting? Explain the steps involved in capital budgeting process?

b) The following are the ratios related to XYZ Ltd. Inventory holding period 2 months Gross profit ratio 25% Gross profit for the current year amounted to Rs. 2,00,000. Closing stock is excess of RS 40,000 over opening stock. Find out: (a) Sales (b) Cost of goods sold. (c) Closing stock (d) Opening stock

**OR**

10. a) A company is considering an investment proposal to install new milling control at a cost of Rs. 55,000/-. The facility has a life expectancy of 5 years and no salvage value. The tax rate is 30%. Assume the firm uses single line depreciation and the same is allowed for tax purposes. The estimated cash flow before depreciation and tax (CFBT) from the investment proposal are as follows

Year	CFBT
1	13,600
2	16,590
3	14,769
4	13,660
5	24,855

Calculate Payback Period, ARR

- b) What is meant by time value of money? What are the methods based on time value of money? (Explain with an illustration.).

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**Managerial Economics and Financial Analysis**

Time: 3 hours

Max Marks: 70

Note: This question of 5 sections. Answer five questions, choosing one question from each section and each question paper contains carries 14 marks.

**Section-I**

1. a) "Managerial Economics is the integration of economic theory with business practice for the purpose of facilitating decision making and forward planning by management". Explain?  
b) Define demand and describe its determinants with suitable examples?  
OR
2. a) What do you understand by Elasticity of demand? How do you measure it? What is its significance? (7M)  
b) What do you understand by demand? What the different types are of demand? (7M)

**Section-II**

3. a) Explain and illustrate the following: and also mention why they arise: a) The Law of Constant Returns b) The Law of increasing returns. (7M)  
b) Discuss about iso quants and iso costs? (7M)  
OR
4. a) Define BEP. How do you determine it. Show graphical presentation of BEA (7M)  
b) You are given the following information for the year 2003 of XYZ Co. Ltd: Variable Cost 6,00,000 60% Fixed Cost 3,00,000 30% Net Profit 1,00,000 10% 10,00,000 100% Find out i) Break Even Point in units and sales ii) PV Ratio iii) Margin of Safety iv) Number of units that must be sold to earn a profit of 5,00,000 v) How many units must be sold to earn a net income of 13.5% of sales (7M)

**Section-III**

5. a) Do you think monopoly is present in the current business environment? Explain it with suitable examples. (7M)  
b) Explain the merits and demerits of different forms of Business organization and their suitability with different types of business Activities (7M)  
OR
6. a) what is pricing? Explain objectives and policies behind pricing. (7M)

b) What is a public enterprise? State the features of public enterprises?? (7M)

### Section-IV

7. a) Define accounting and write the importance, limitations & process of accounting. (7M)

b) what is working capital? Explain about working capital cycle. (7M)

OR

8. a) What is a Trial balance? List out the items that appear in a Trial balance?.

b) What is an account? How would you classify different accounts maintained by a business enterprise?(7M)

### Section-V

9. a) What do you mean by capital budgeting? Explain its significance (7M)

b) What is ratio analysis? Explain different types of ratio analysis (7M)

OR

10. a) A company is considering an investment proposal to install new milling controls at a cost of Rs.50,000. The facility has a life expectancy of 5 years and no salvage value. The tax rate is 35 percent. Assume the firm uses straight line depreciation and the same is allowed for tax purposes. The estimated cash flows before depreciation and tax (CFBT) from the investment proposal are as follows:

Year	CFBT
1	10,000
2	10,692
3	12,769
4	13,462
5	20,385

Calculate the following: payback period, ARR and net present value at 10 percent discount rate. (7M)

b) How do you calculate Payback period and ARR. Explain with an example? (7M)

