Code No: NR210303 **NR**

II B.Tech I Semester Supplementary Examinations, November 2005
ELECTRICAL ENGINEERING
(Common to Mechanical Engineering, Chemical Engineering, Mechatronics, Metallurgy & Material Technology, Production Engineering and Aeronautical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Derive an expression for the equivalent Inductance when two coils one connected in parallel. [8]
   (b) Two coils of inductances 4 and 6 henries are connected in parallel. If their mutual inductance is 3 henries, calculate the equivalent Inductance of the combination if
   (i) Mutual inductance assists the self-Inductance
   (ii) Mutual inductance opposes the self Inductance. [8]

2. (a) A voltage V is applied across two impedances in parallel. The value of impedances are (3-j3)ohms, and (5+j2) ohms. Voltage across 3Ω is 45V. Calculate applied voltage V and current I. [8]
   (b) A voltage of $200\angle 53^o 8'$ is applied across two impedance in parallel. The values of impedances are (12+j16) and (10-j20). Determine the KVA, KVAR and KW in each branch and the power factor of the whole circuit. [8]

3. (a) What purpose is served by the pole shoe in a d.c. machine? [4]
   (b) What are the advantages and disadvantages of carbon brushes? [4]
   (c) Why do we use slotted armature in a d.c. machine? [4]
   (d) Why is armature winding placed on the rotor of a d.c. machine? [4]

4. (a) A 50KW, 440V shunt generator having an armature circuit resistance including inter pole winding of 0.15 Ω at normal working temperature was run as a shunt motor on no load at rated voltage and speed. The total current drawn by the motor was 5A including shunt filed current of 1.5A. Calculate the efficiency of the shunt generator at $3/4^{th}$ full-load. [12]
   (b) What are the disadvantages of swinburne's test. [4]

5. (a) On what factors the induced EMF in the transformer windings depends. Justify the answer with appropriate derivation. [6]
   (b) A double wound 1- phase transformer is required to step down from 1900V to 240V, 50Hz . It is to have 1.5V per turn . Calculate the required number of turns on the primary and secondary windings respectively. The peak value of flux density is required to be not more than 1.5 wb/m^2 . Calculate the required cross sectional area of the steel core. If the output is 10KVA . Calculate the secondary current. [10]

6. (a) Explain the rotating magnetic field developed in an Induction Motor. [10]
   (b) A12 pole 3- phase alternator coupled to an engine running at 500rpm. It supplies an induction motor which has a full load speed of 1440rpm. Find the % slip and the number of poles of the motor. [6]

7. (a) Explain the calculation part of %regulation after conducting OC and SC tests using EMF method. [8]
   (b) 100KVA , 3KV, 50Hz, 3-phase star connected alternator has effective arrmature resistance of 0.2 Ohms . The field current of 30Amps produces SC current of 180 Amps and an OC volts of 1060V (line value) .Calculate the full load voltage regulation at 0.707 PF lag and 0.8PF leading .Draw the phaser diagram. [8]

8. (a) Sketch and describe the construction of a moving coil ammeter and give the principle of operation. [8]
   (b) A moving coil instrument gives full scale deflection with 15mA and has a resistance of 5Ω. Calculate the resistance of the necessary components in order that the instrument may be used as
      i. a 2A - Ammeter
      ii. a 100V voltmeter. [8]

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