(3 Hours) **[Total Marks:80]**

N.B. **(1)** Question no.1 is compulsory.
(2) Attempt any three from the rest.
(3) Make any suitable assumption wherever required.

Q.1 Answer any four.

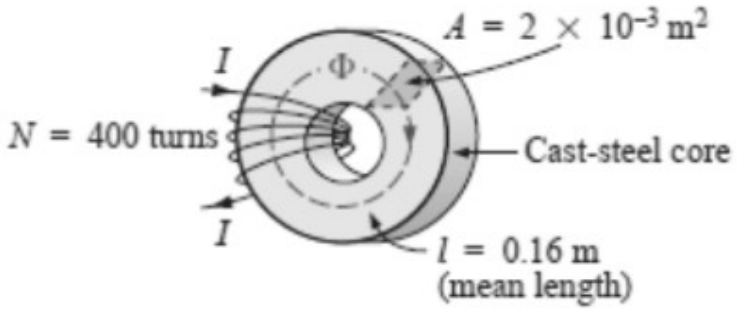
(a)	What is the armature reaction in DC machine?	5M
(b)	Define different types of errors.	5M
(c)	What is ammeters shunts & voltmeter multiplier,	5M
(d)	Differentiate between series and parallel magnetic circuit.	5M
(e)	Write difference between Resolution & sensitivity of digital meters	5M

Q.2 **(a)** Derive torque equation of Doubly excited system. 10M

(b) For the series magnetic circuit of Figure 10M

a) Find the value of I required to develop a magnetic flux of Ø =4 x 10^{-4} Wb

b) Determine μ and μr for the material under these conditions. For B= 0.2 T, the value of H (Cast steel) =170 AT/m



Q.3 **(a)** Explain construction & working of MI instrument and derive the torque equation. 10M

(b) Explain three pointers starter in DC motor with neat diagram, why starter is required in dc motor? 10M

Q.4 **(a)** Explain calibration of ammeter and voltmeter using potentiometer. 10M

(b) With respect to EMEC explain following terms i) Leakage flux ii) MMF iii) Rotating MMF 10M

Q.5 **(a)** Explain working principles of digital Voltmeter, Ammeter 10M

(b) What are different methods for speed control of DC motor explain Field flux control in detail with diagram and characteristics. 10M

Q.6 Write a short note on any two

(a)	Hopkinson's test on DC Machine	10M
(b)	Energy and co energy stored in magnetic field.	10M
(c)	Instrument transformers	10M
