Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent institution of MAHE, Manipal)

IV SEMESTER B.TECH. (MECHATRONICS ENGINEERING)

MAKEUP EXAMINATIONS, MAY 2018

SUBJECT: MEASUREMENTS & INSTRUMENTATION [MTE 2204]

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Data not provided may be suitably assumed with justification

1A State the difference between Static characteristics and Dynamic characteristics. Define the following four terms: **03**

a. Hysteresis b. Dead zone c. Sensitivity d. Threshold

1B For the proper functioning of any kind of electromechanical indicating instrument, the presence of three forces is inevitable. Explain each of those forces and elucidate the operation of Gravity control system with required diagram. **05**

1C A thermometer is calibrated 150 ˚C to 200 ˚C. The accuracy is specified within ±0.25 percent of the instrument span. What is the maximum static error? **02**

2A Explain the working principle of Load cell and with the neat diagram state the operation of Hydraulic Load cell. **04**

2B A Pressure gauge, which has linear calibration curve, has radius of scale line as 90mm and pressure of zero to 60 pascals is displayed over a full scale deflection of 300°. Determine the sensitivity of the gauge as a ratio of scale length to pressure in mm/Pa. **03**

2C Using mathematical expressions, explain how Capacitive transducer can be utilized for measurement of pressure. **03**

3A A D'Arsonval meter movement with a full scale deflection current rating 0f 3Ma and an internal resistance of 800Ω is to be used in a half wave rectifier ac voltmeter (where the resistance of the diode is negligible). Calculate the ac and dc sensitivity and the value of the multiplier resistor for a supply voltage of 50V. **02**

3B	With required circuit diagram, discuss how basic D'Arsonval galvanometer can be converted into DC ammeter and DC voltmeter.	**05**
3C	State the working principle of Hall-effect sensor. With a neat diagram, elaborate how Hall effect sensor can be used for the displacement measurement.	**03**
4A	List any 3 difference between Successive approximation ADC and Flash type ADC.	**03**
4B	Mention any two instruments for measuring speed of a rotating shaft. Elucidate how inductive type tachometer can be used for the measurement of rotating shaft.	**03**
4C	A clearance fit has to be provided for shaft and bearing assembly having a diameter of 40mm. Tolerances on hole and shaft are 0.006 and 0.004 mm, respectively. The tolerances are disposed unilaterally. If an allowance of 0.002 mm is provided, find the limits of size for hole and shaft when a Hole basis system is used and represent the fit graphically.	**04**
5A	Derive an expression for modified Anderson's bridge with the required Circuit.	**04**
5B	In a test by Murray loop method for a fault to earth on a 960m length of cable having a resistance of 2.7 Ω per 1000m, the faulty cable is looped with a sound cable of the same length but having a resistance 3.86 Ω per 1000meter. The resistance of the other 2 arms of the testing network, at balance are in the ratio of 3.5: 1. Calculate the distance of fault from the testing end of test cable.	**02**
5C	With the help of neat sketch describe the interference and transition fit according to both hole and shaft basis system.	**04**