Reg. No.										

MANIPAL ACADEMY OF HIGHER EDUCATION

SEVENTH SEMESTER B. ARCH. DEGREE EXAMINATION – NOVEMBER 2019

SUBJECT: ARC-14-409.3 - ADVANCED BUILDING SERVICES

(2014 SCHEME)

Thursday, November 14, 2019

Time: 14:00 – 17:00 Hrs. Max. Marks: 50

- **Answer any FIVE questions fully.**
- **Give neat sketches wherever relevant.**

1. As a part of feasibility study of a multi-storied residential apartment project approximate estimation and costing of electrical services are to be done. Explain why this needs to be done before architectural design in a case of limited ground? Also explain the method of estimation of area requirement for sub-station that includes area for stand-by power (DG set).

(10 marks)

2. Explain the points to be taken care of while deciding water storage in a multi-storied residential building (tanks, pumps and pipes).

(10 marks)

3. An office space 5 × 5 m in area and 2.7 m in height, is located on an intermediate floor of a large building. It has (only) one exposed wall facing south, all other walls adjoin rooms kept at the same temperature: T =Ti. The ventilation rate is three air changes per hour. Three 100W bulbs are in continuous use to light the rear part of the room, which is used by four clerical workers. The exposed 5 × 2.5 m wall consists of:

   (i) A single glazed window, 1.5m × 5 m and (ii) a brick masonry wall, 200 mm thick, rendered and plastered 1m × 5 m

   Climatic information, for critical time: Out-door temperature = 27°C

   - Desired internal temp 20°C
   - Incident radiation (I) on southern wall= 580 W/m^2
   - U value for glass = 4.48 W/m^2 degC
   - U value brick masonry wall 0.5 W/m^{2}degC
   - Coeff. of absorption of the wall surface (a) = 0.4
   - Surface conductance (fo), = 10 W/m^{2}degC
   - Solar gain factor for window (θ) = 0.75
   - Volumetric specific heat of air = 1300 W/m^{3}degC

3A. Determine the optimum size of rectangular ducts for supplying cold air at 16°C at 2m/s so as to keep the indoor temperature at 20°C.

3B. What are the implications of (i) depth of duct (ii) velocity of supply air (iii) position of cool air-outlet

(7+3 = 10 marks)

4. Explain the components of a sewage treatment plant for a multistoried residential apartment. Also explain the site planning implications of the same.

(10 marks)

5. Explain the method of heat gain calculation by a building as a part of air conditioning system design. Explain the options Architect can consider for optimizing equipment capacity.

(10 marks)

6. **Explain the following:**

6A. Chilled water system of air conditioning and its energy saving options.

6B. Design decisions regarding provision of automatic sprinklers for fire-fighting in an office space.

(6+4 = 10 marks)