# MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
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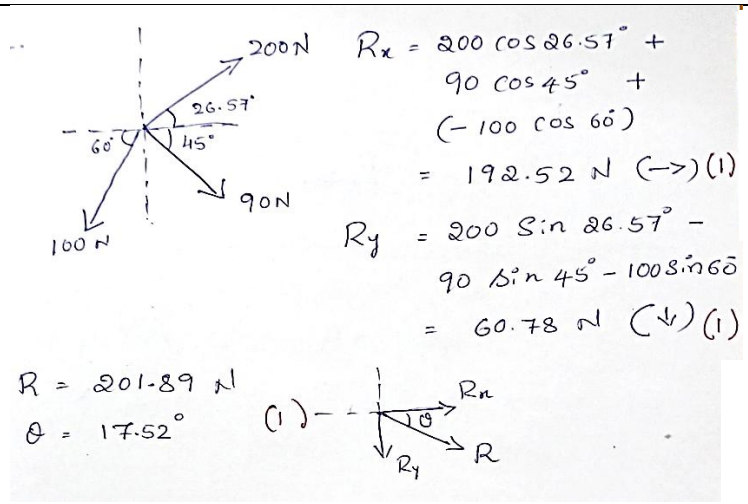
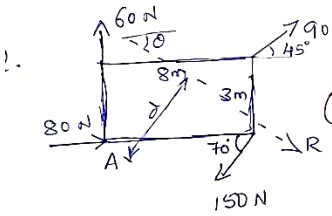
| **DEPARTMENT OF CIVIL ENGINEERING** | | | |
| **MID-TERM EXAMINATION** | | **MARCH 2025** | |
| **Level** | **B.Tech** | **Curriculum** | **2024** |
| **Program Name** | | **Course Type** | **CORE** |
| **Course Name** | **ENGINEERING MECHANICS AND SMART BUILDINGS** | **Course Code** | **[CIE 1072]** |
| **Semester** | **II** | **Max Marks** | **30** |
| **Date** | **06/03/2025** | **Duration** | **90 MIN** |

**Answer Scheme**

| Q. No. | Answer/solution | Marks |
|---|---|---|
| Q1 |  $R_x = 200\cos 26.57^\circ + 90\cos 45^\circ + (-100\cos 60)$ $= 192.52\ N\ (\rightarrow)\ (1)$ $R_y = 200\sin 26.57^\circ - 90\sin 45^\circ - 100\sin 60$ $= 60.78\ N\ (\downarrow)\ (1)$ $R = 201.89\ N$ $\theta = 17.52^\circ$ (1)  | 3 |
| Q2 |  $R_x = 90\cos 45^\circ - 150\cos 70^\circ + 80$ $= 92.34\ N\ (\rightarrow)\ (1/2)$ $R_y = 90\sin 45^\circ - 150\sin 70^\circ + 60$ $= 17.31\ N\ (\downarrow)\ (1/2)$ $R = 93.95\ N\ (1/2)$ $\theta = 10.62^\circ$ $M_A = 90\cos 45^\circ (3) - 90\sin 45^\circ (8) + 150\sin 70^\circ (8)$ $= 809.43\ N\text{-}m\ (\circlearrowright)\ (1)$ $d = 8.62\ m$ | 3 |

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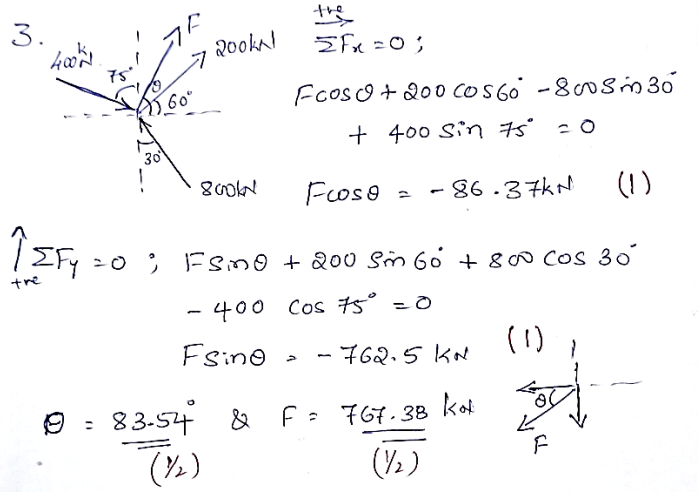
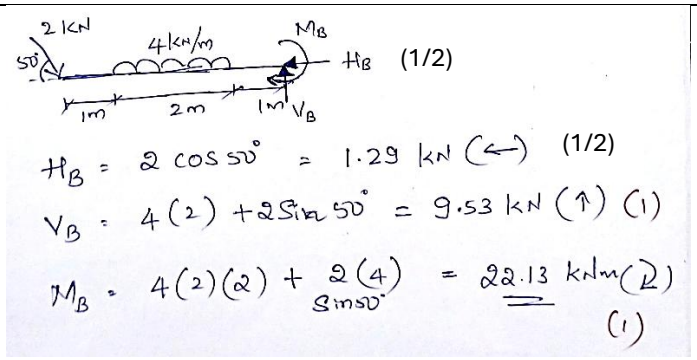
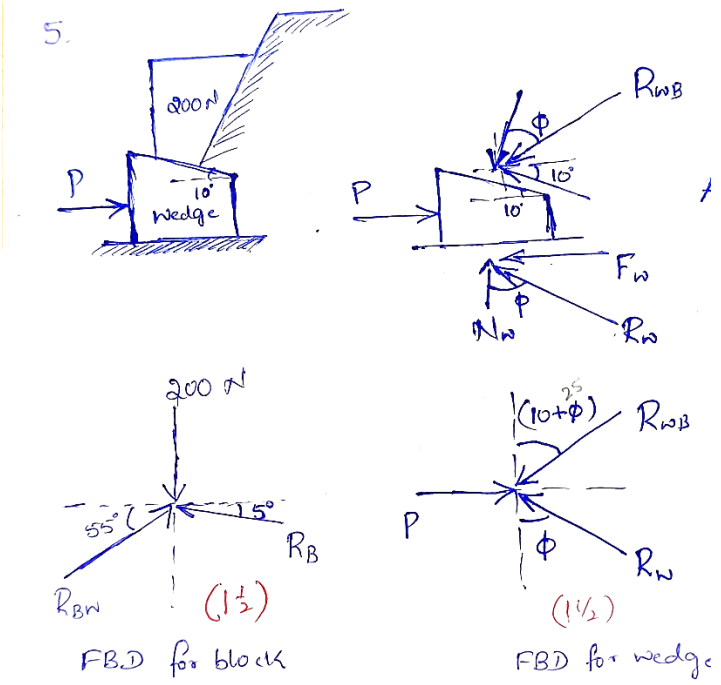
| **Q3** |  | 3 |
| **Q4** |  | 3 |
| **Q5** |  | 3 |
| **Q6** | (i) Air dampers: Allow or curtail the flow either from exhaust, outside air, or return air. It is required to control the mixing of outside air or to send the inside air through exhaust. | 3 |

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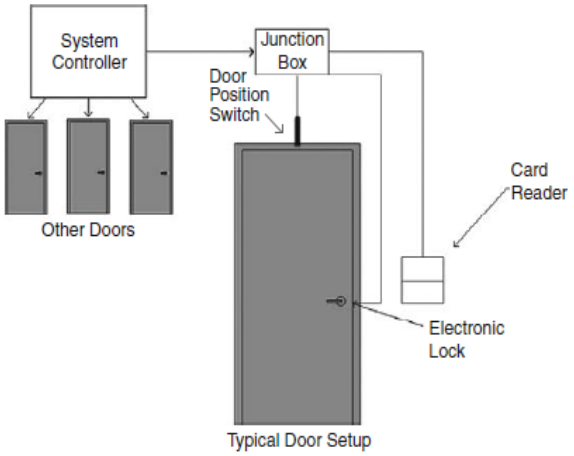
| | (ii) Temperature and Humidity Sensors: These sensors are used to check the concerned parameters of return air from room to re-processing at AHU or after processing of the air, just before supply of chilled/hot air to room as per requirement.<br><br>(iii) Return fan: This helps in clearing the inside air at variable speeds. In the case of the temperature to be changed quickly (lowered or raised) inside the room, this fan helps to clear the inside air through suction and allows processed air for circulation.<br><br>(iv) Mixing Chamber: Mixing chamber generally has cooling of heating coils so that mixing of return air/outside air is done before delivered into the room with the set temperature.<br><br>(v) Supply fan: This is also important fan just like return fan. This fan with its variable speed can deliver the required temperature air through its varied air flow.<br><br>(vi) Filters: Filters play an important role in supplying clean air to mixing unit when is drawn from outside as well as the return air from room, thereby maintaining the clean air environment inside. | 0.5 Marks each |
| **Q7** | The smart lighting and fire alarm system are interlinked and plays a major role in the case of fire incident.<br><br>When the power is cut-off for safety, the smart lighting should ensure the emergency lighting through other circuit.<br><br>It should ensure and activate this parallel system in case fire alarm from a zone is activated.<br><br>It should also ensure the lighting of other zones without disturbing the operation. Hence, all exit boards and floor lighting lines should be connected to fire alarm system. | 3 |
| **Q8** |  | 3<br><br>Figure 1 mark |

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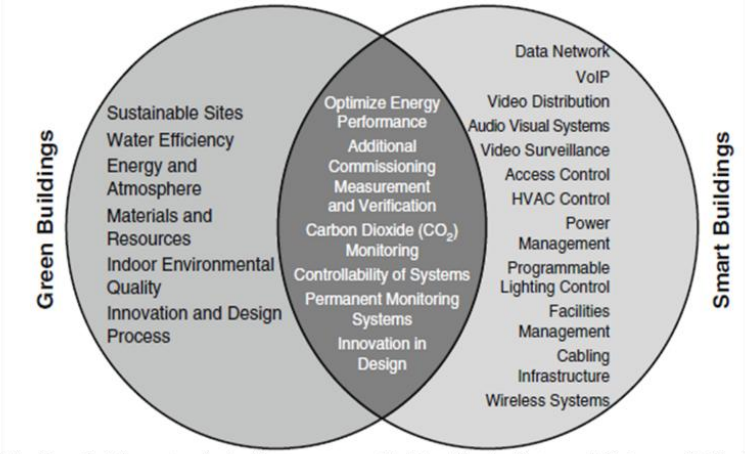
| | The server or host computer **houses the operating parameters** and the **database** for the access control system. The host computer is networked and **communicates** with the **control panels** which collect data on events and alarms from peripheral devices.<br><br>Control panels are usually **enclosed with printed circuit boards** with connections to all peripheral devices in their area. These peripheral devices may include door hardware (such as a card reader, door position switch, or door strike) and other inputs and relays as required.<br><br>The control panel manages the peripheral devices and communicates between the host computer and the peripheral devices. | Explanation 2 marks |
| **Q9** | The traditional TV has broadcasting only. Whereas the IPTV' s major facility like VoD, live TV and time shifted media makes it unique.<br><br>VoD supplies the content to the user from the already stored media library on an individual view basis.<br><br>Time shifted media allows the user to pause, replay and rewind the LIVE content at the user's pace.<br><br>Live TV is similar to broadcast TV, but it is on IPTV through the internet. The user can watch live shows/ sports through the internet even in mobile handsets. | 3 |
| **Q10** |  <br>*Refer: Smart building systems for Architects, owners and builders, Elsevier, Butterworth-Heinemann Publications, 2010* | 3 |