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## UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2018

Program: B. Tech-ADE

Subject (Course): AUTOMOTIVE HVAC

Course Code : ADEG-355

No. of page/s: 02

Semester : VI

Max. Marks : 100

Duration : 3 Hrs.

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### Instructions:

Attempt all questions from **Section A** (Comprises of four questions each carrying five marks); **Section B** (Comprises of four questions each carrying Ten marks). **Section C** (Comprises of two questions each carrying Twenty marks).

#### Section A

- |    |  |     |     |
|----|--|-----|-----|
| Q1 | Compare Vapor Compression Refrigeration system with Vapor Absorption Refrigeration System?   | [5] | CO2 |
| Q2 | 800 m <sup>3</sup> /min of recirculated air at 22 deg C DBT and 10 deg C dew point is to be mixed with 300 m <sup>3</sup> /min of fresh air at 30 deg C DBT and 50% RH. Determine the enthalpy, specific volume, humidity ratio, dew point temperature of mixture. | [5] | CO4 |
| Q3 | List out different types of ducts based upon working pressure range.   | [5] | CO5 |
| Q4 | Differentiate Effective room sensible heat factor and room sensible heat factor.   | [5] | CO4 |

#### Section B

- |    |   |      |     |
|----|---|------|-----|
| Q5 | In a cooling application moist air enters a refrigeration coil at the rate of 100 kg of dry air per minute at 35 deg C and having 60% relative humidity. The apparatus dew point of the coil is 5 deg C and by pass factor is 0.15. determine the outlet state of the moist air and cooling capacity of coil in 1 TR. | [10] | CO3 |
| Q6 | State various sensible and latent heat gain imposed on air conditioning plant operating on hot weather?   | [10] | CO4 |
| Q7 | Illustrate various methods to determine duct size?  | [10] | CO5 |
| Q8 | State various factors that affecting human comfort?   | [10] | CO3 |

OR

- |  |  |      |     |
|--|--|------|-----|
|  | Classify the air conditioning system with labeled diagram. | [10] | CO3 |
|--|--|------|-----|

#### SECTION C

Q9 The following data refers for a space to be air conditioned

Outside Design Condition = 43<sup>0</sup>C DBT, 27.5<sup>0</sup>C WBT

Inside Design Condition = 25<sup>0</sup>C DBT, 50% RH

Room sensible heat gain = 20 KW

Room Latent Heat Gain= 5KW

Apparatus Due Point= 12<sup>0</sup>C

CO4

[20]

80% of the return air from the room is mixed with outside air before entry to the cooling coil. Determine 1) By-Pass factor 2) Condition of air entering and leaving the cooling coil 3) Fresh Air Mass and volume flow rate 4) Refrigeration load on the cooling coil. 5) Effective Room Sensible Heat Factor

**OR**

An air-conditioned auditorium is to be maintained at 27 deg C and relative humidity should be 60%. The ambient conditions are 40 deg C and 30 deg C wet bulb temperature. The total sensible heat gain is 80000 KJ/h and total latent heat gain is 20000 KJ/h. 60 % of the return air is recirculated and mixed with 40% of make-up air after the cooling coil. The condition of air leaving the cooling coil is 18 deg C.

CO4

Determine 1) Room Sensible Heat Factor 2. The condition of Air entering the auditorium. 3) The amount of Make-up air. 4) Apparatus due Point 5. By pass factor of the coil.

Show the process on psychometric chart.

Q10

A length of main circular duct has three branch ducts taking equal air volumes at equal intervals. Each interval duct has a friction loss of 1.3 mm of water and a static pressure of 5mm of water is necessary at each branch to cope with its friction loss. If the initial velocity in the main duct of 1.2 m diameter is 600 m/min, calculate the velocities and diameters of second and third length, whereby the static pressure regain sufficient to overcome the friction loss in the succeeding length of main duct up to next branch. The static pressure regain factor is 0.6.

[20]

CO5

Draw a simple sketch of the duct system and identify total, static and velocity pressure at the appropriate points of change.