MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION

B.Tech. (Agril. Engg.)

Semester	: **IV (New)**	**Term**	: **II**	**Academic Year**	:	**2010-11**
Course No.	: APE 243	**Title**	: **Heat and Mass Transfer**			
Credits	: 2 (1+1)					
Day & Date	: Wednesday, 20.04.2011	**Time**	: 14.00 to 16.00	**Total Marks**	:	**40**

Note : 1. Solve **ANY EIGHT** questions from **SECTION "A".**
2. All questions from **SECTION "B"** are compulsory.
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

SECTION "A"

Q.1 An air conditioned room has one of the walls which is 5m x 3m of 35 cm thick brick. The conditioned space is maintained at 20^0 C when the outside temperature is 45^0 C. The variation in thermal conductivity with temperature is given by $k = 0.95 + 1.3 \times 10^{-7} T^2$ where T is in degree Kelvin, k is in $W/m^0 K$. Calculate the heat gained by the conditioned space through this wall.

Q.2 A steam pipe of 10 cm outside diameter is covered with two layers of insulating material each of 2.5 cm thick, one having thermal conductivity thrice than other. Show that the effective conductivity of two layers is approximately 15% less when better insulating material is inside than when it is on the outside.

Q.3 Derive an expression for logarithmic mean temperature difference (LMTD) for parallel flow.

Q.4 Exhaust gases flowing through the tubular heat exchanger at the rate of 20 kg/min are cooled from 450^0 C to 150^0C by water initially at 20^0 C. The specific heat of gases may be taken as 1.13 KJ/kg^0K and overall heat transfer coefficient may be taken as 140 W/m^2. Calculate the surface area needed if the water flow is 25 kg/min for parallel flow.

Q.5 Describe the heat exchangers in brief with neat sketches.

Q.6 Explain the phenomenon of radiation heat transfer. Explain absorptivity, reflectivity and trnasmissivity of radiation.

Q.7 Write short notes on (Any Two)

1) Extended surfaces
2) Critical thickness of insulation
3) Grey bodies

Q.8 Derive the equation for heat transfer through composite cylinder.

Q.9 Explain the analogy between flow of heat and electricity.

Q.10 What is Newton's law of cooling? Derive an expression for heat transfer coefficient between solid wall and fluid.

(P.T.O.)

SECTION "B"

Q.11 Fill in the blanks.

1) The heat transfer is constant when temperature remains _____ with time.
2) The Fourier law of heat transfer by conduction is expressed as _____.
3) The term hl/k is called _____.
4) The quantity of heat radiation is dependent on _____ of the body only.

Q.12 State True or False.

1) Thermal conductivity of water first increases with temperature then decreases with temperature.
2) In free convention heat transfer, Nusett number is a function of Prandtl number and Grashof number.
3) The radial heat transfer rate through hollow cylinder increases as the ratio of outer radius to inner radius decreases.
4) The term $kA/\Delta x$ with usual notations is called thermal resistance of the wall.

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B.Tech. (Agril. Engg.)

Semester	: **IV (New)**	**Term**	: **II**	**Academic Year**	: **2010-11**
Course No.	: IDE 242	**Title**	: **Irrigation Engineering**		
Credits	: 3 (2+1)				
Day & Date	: Saturday, 23.04.2011	**Time**	: 14.00 to 17.00	**Total Marks**	: **80**

Note : 1. Solve **ANY EIGHT** questions from **SECTION "A".**
2. All questions from **SECTION "B"** are compulsory.
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

SECTION "A"

Q.1 a) Write in brief how irrigation is beneficial to agriculture. What are the harmful effects of excess irrigation?

b) Explain in brief the major sources of water for irrigated agriculture.

Q.2 a) Wheat crop requires 40 cm of irrigation water during 120 days irrigating period. How much land can be irrigated with a flow of 30 lps for 22 hours for a day?

b) What are different types of weirs? Explain rectangular weir with a neat sketch and formulae for determination of discharge.

Q.3 a) Calculate the velocity of flow and carrying capacity of the trapezoidal channel laid on a slope of 0.10 per cent. The depth of flow of water in channel is 40 cm, bottom width of channel is 40 cm and side slope is 1:1. Assume Manning's n = 0.025.

b) Define land leveling. State and describe the criteria for land leveling.

Q.4 a) Determine the discharge capacity of an underground concrete pipe line if diameter of pipe is 15 cm, length of pipe is 150 m and elevation difference between pump stand and out let is 3 m. Assume value of f =0.01.

b) Explain in brief the kinds of soil water.

Q.5 Establish infiltration equation for the following set of observations.

Elapsed time (min)	1	2	3	4	5	10	15	20	25	30
Instantaneous infiltration depth (cm)	0.60	0.24	0.17	0.14	0.10	0.30	0.20	0.15	0.10	0.08

Q.6 a) Explain soil moisture constants in brief.

b) Describe the methodology of Lysimeter experiment.

Q.7 a) Explain different types of irrigation efficiencies.

b) Classify different irrigation methods.

(P.T.O.)

Q.8 a) Differentiate between border and furrow methods of irrigation.

b) A furrow having length of 90 m and spaced at 72 cm is irrigated by stream of initial discharge of 2 lps. The stream size was reduced to 0.5 lps, when initial stream reached at the end of furrow after 60 minutes. Find the average depth of irrigation, if cut back stream is continued for 1 hour.

Q.9 a) Explain with figure the recession characteristic of water in check basin.

b) An irrigation stream of 27 litre/second is diverted to a check basin of size 12 x 10 m. The field capacity of soil is 24% while average moisture content of soil before irrigation is 16%. Calculate the time for which water should be released to the check basin to bring the soil root zone of 1.20 m to the field capacity. Assume apparent specific capacity of soil equal to 1.50 gm/cc.

Q.10 Write short notes on (Any Two)

1) Blaney-Criddle Method.
2) Parshall flume
3) Common troubles of under ground pipe lines.

SECTION "B"

Q.11 Define the followings.

1) Irrigation
2) Accumulated infiltration rate
3) Available water
4) Evapotranspiration
5) Net irrigation requirement
6) Irrigation frequency
7) Seepage
8) Porosity

Q.12 Fill in the blanks.

1) The relative proportion of sand, silt and clay is termed as _____.
2) 1 ha-cm = _____ m^3.
3) _____ plant is commonly used as the indicator for permanent wilting percentage.
4) _____ is the process by which water vapors leave from the living plant body and enter the atmosphere.
5) The unit of water use efficiency is _____.
6) _____ is the ratio between the cross-sectional area of the stream and its wetted perimeter.
7) _____ is the depth from which the roots of an average mature plant are capable of reducing soil moisture to the extent that it should be replaced by irrigation.
8) _____ water is not available to plants.

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B.Tech. (Agril. Engg.)

Semester	: **IV (New)**	**Term**	: **II**	**Academic Year**	: **2010-11**
Course No.	: SWCE 244	**Title**	: **Soil and Water Conservation Engineering**		
Credits	: 3 (2+1)				
Day & Date	: Thursday, 21.04.2011	**Time**	: 14.00 to 17.00	**Total Marks**	: **80**

Note : 1. Solve **ANY EIGHT** questions from **SECTION "A".**
2. All questions from **SECTION "B"** are compulsory.
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

SECTION "A"

Q.1 a) Explain the classification of gullies.

b) What is graded bund? Describe the function, suitability and specifications of graded bunding.

Q.2 a) Explain the various types of sediment loads.

b) Calculate the soil erodibility factor of USLE with following information.

Rain fall intensity = 5 cm/hr

Maximum 30 min rainfall intensity of the storm = 0.5 cm/h

Observed soil loss = 4.5 tonnes/ha

LS factor = 1

(Assume the depth of rainfall as 3 cm)

Q.3 Explain the land capability classification developed by U.S. department of soil conservation services.

Q.4 Calculate the height and cross-sectional area of contour bund to be constructed on a land slope of 5%. The other details are given as under_____

Rainfall excess for 24-h duration is 80 mm

Horizontal Interval = 15 m

Depth of water flow over the weir = 30 cm

Q.5 a) Explain the factors affecting water erosion.

b) Explain the stages of gully erosion.

Q.6 Write short notes on the followings.

1) Strip cropping
2) Rill erosion

Q.7 Design a parabolic grassed waterway to convey a peak flow of $6m^3/s$ on 1 per cent slope with erodible sandy soil. The waterway has a good grass cover and a permissible velocity of 1.5 m/s can be allowed. Assume the value of Manning's coefficient as 0.034.

(P.T.O.)

Q.8 What is the USLE? Explain in detail its different parameters.

Q.9 Enlist all the temporary gully control structures and explain any two in detail.

Q.10 a) Explain the importance and techniques of water harvesting.

b) Explain the types of initial soil particle movement during wind erosion.

SECTION "B"

Q.11 Define the followings.

1) Terminal velocity
2) Saltation
3) Trap efficiency
4) Shoulder bund
5) Bed load
6) Accelerated erosion
7) Contour farming
8) Sediment delivery ratio

Q.12 Fill in the blanks.

1) The rate of soil erosion in red soil by sheet erosion is estimated as _____ to _____ tonnes / ha / yr.
2) _____ bunds are formed at the outer edge of the terrace to hold the runoff over the top of the terrace.
3) The most vulnerable range of particles for saltation movement is from _____ to _____ mm diameter in wind erosion.
4) Detachability increases as the size of the soil particles _____.
5) Shelter belt is a longer barrier than _____.
6) The mode of sediment movement in bed load depends upon _____.
7) Soil transportability _____ with decrease in the particle size.
8) _____ water harvesting technique is used mainly for domestic purpose.

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B.Tech. (Agril. Engg.)

Semester	: **IV (New)**	**Term**	: **II**	**Academic Year**	: **2010-11**
Course No.	: FMP 247	**Title**	: **Farm Machinery and Equipment – I**		
Credits	: 2 (1+1)				
Day & Date	: Friday, 29.04.2011	**Time**	: 14.00 to 16.00	**Total Marks**	: **40**

Note : 1. Solve **ANY EIGHT** questions from **SECTION "A".**
2. All questions from **SECTION "B"** are compulsory.
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

SECTION "A"

Q.1 Explain the factors to be considered while selecting the farm machinery.

Q.2 a) What is farm mechanization? State the benefits of farm mechanization.
b) What is primary tillage? Enlist different equipments used for primary tillage.

Q.3 A three bottom 40 cm mould board plough is working at a depth of 16 cm. Calculate the unit draft, actual horsepower required and actual field capacity if the draft is 1440 kg. Take the speed of the tractor as 4.5 km/hr and field performance index as 0. 75.

Q.4 Explain the forces acting on tillage tools with neat sketch.

Q.5 a) Explain the procedure for measuring draft of pull type implements.
b) What is harrow? Enlist different types of harrows used in India.

Q.6 What are the types of elevators? Explain any one in brief.

Q.7 a) State different types of metering devices used on seed cum fertilizer drill. Explain fluted roller mechanism in short.
b) Enlist the design parameters for fertilizer distributor.

Q.8 A field experiment shows that the average emergence of paddy is 48 percent, the row to row distance is 100 cm and plant to plant spacing is 90 cm,
1) Find the number of seeds that should be planted per hill to raise 37000 plants per hectare?
2) What is the seed spacing if the crop is drilled?

Q.9 a) What are the functions of cultivator? State different types of cultivators according to soil working tool.
b) A tractor is attached with a 9 tine cultivator. While field testing, drawbar dynamometer shows an average pull of 14000 N. The speed of tractor is 6 km per hour. Find the power of the tractor.

Q.10 Write short notes on.
1) Bulldozer
2) Rotavator

(P.T.O.)

SECTION "B"

Q.11 Fill in the blanks.

1) _____ is the reduction in value of machine due to passage of time.
2) Vertical disc plough is also known as _____.
3) _____ type furrow openers are best suited for stony or root infested fields.
4) The top portion of the turned furrow slice is called _____.

Q.12 Define.

1) Bach furrow
2) Theoretical field capacity
3) Horizontal suction
4) Concavity

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