Seat No.

F.E. (All) Examination, May - 2018
BASIC MECHANICAL ENGINEERING
Sub. Code : 59186

Day and Date : Thursday, 17 - 05 - 2018   **Total Marks : 100**

Time : 10.00 a.m. to 01.00 p.m.

Instructions :   1)   Answer any 3 questions from each section.

2)   Figures to the right side indicate marks.

3)   Draw the diagram wherever necessary.

4)   Assume suitable data if necessary.

SECTION - I

Q1) a) Define heat and work. State and explain different forms of work. **[8]**

b) Define Intensive and Extensive property. Classify the following quantities whether they are intensive or extensive by specifying reasons, **[8]**

    i)   Pressure

    ii)   Energy

    iii) Temperature

    iv)   Density

    v)   Enthalpy

Q2) a) A steam turbine operates under steady flow conditions receiving steam at the following state. Pressure 20 bar, internal energy 3000 KJ/Kg, specific volume 0.12 m³/Kg and velocity 120 m/s. The exhaust of steam from the turbine is at 0.1 bar with internal energy 2200 KJ/Kg, specific volume 15 m³/Kg and velocity 310 m/s. The intake is 5 m above the exhaust. The turbine develops 45 Kw and heat loss over the surface of turbine is 30 KJ/Kg. Determine the steam flow rate through the turbine. **[8]**

b) What is PMM-I and PMM-II and why it is impossible. **[8]**

Q3) a) Compare SI and CI engine. **[8]**

b) With neat sketch explain construction and working of four strokes CI engine. **[8]**

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Q4) a) Explain with neat sketch working of vapour absorption refrigeration system. [9]

b) What are the desirable properties of a refrigerant? [9]

SECTION - II

Q5) a) Explain flat plate collector and concentric collector with help of neat sketch. [8]

b) What is priming? Explain the working of reciprocating pump with neat sketch. [8]

Q6) a) A leather belt transmits 30 Kw from a pulley 750 mm in diameter running at 500 rpm. The angle of contact is 160° and coefficient surfaces are 0.3. If the permissible stress in the belt is not to exceed 2 MN/m2, determine the belt cross-section area. [8]

b) Explain with neat sketch working of Kaplan Turbine. [8]

Q7) a) What are the different of metal removing process? Explain milling process with neat sketch. [8]

b) Explain Sand Casting Process in detail with neat sketch. [8]

Q8) Write short note on [18]

i) Fuel Cell

ii) Chain Drive

iii) Impulse Turbine

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Subject: Engineering Chemistry   Code : 59183

Day and Date : Tuesday, 09-12-2014   **Time :** 10 a.m. to 01 p.m.

Total Marks: 100

Instructions: 1) All questions are compulsory.

2) Draw neat labeled diagram whenever necessary.

3) Figure at right side indicates full marks.

SECTION - I

Q.1) a) A sample of water on analysis was found to contain the following impurities;

Salt	in ppm
$Mg(HCO_3)_2$	16.8
$MgSO_4$	24
$Ca(HCO_3)_2$	22
$MgCl_2$	19
$CaCl_2$	70

Calculate temporary, permanent and total hardness.   **8**

b) Solve any TWO of the following.   **10**

i) Write short note on Thermosetting plastics

ii) What are the causes and disadvantages of scale and sludge formation?

iii) Write short note on 'Conducting polymers'

Q.2) a) With schematic diagram, explain principle, instrumentation and working of GLC.   **6**

b) Solve any TWO of the following.   **10**

i) Write preparation, properties and applications of urea-formaldehyde resin.

ii) Write classification of chromatography in brief.

iii) Explain ion exchange process for the treatment of hard water.

Q.3) Solve any FOUR of the following.   16

    a) What is FRP? Mention different properties and commercial uses of FRP.

    b) Enlist merits and demerits of instrumental methods.

    c) Write short note on 'Lambert law'.

    d) Enlist different impurities present in natural water? How are they removed?

    e) Write short note on 'Alkalinity of water sample'.

    f) What are Nanomaterials? Explain different applications of it.

SECTION - II

Q.4) a) On burning 0.83 gm of solid fuel in a Bomb   8

    Calorimeter, temperature of 3500 gm of water increased from 26.5^0c to 29.2^0c. Water equivalent of calarimeter is 385 gm and latent heat of steam is 587 cal/gm. If the fuel contains 7% hydrogen, calculate gross and net calonfic value of fuel.

b) Solve any TWO of the following.   10

    i) What is electrochemical corrosion? Explain oxygen asorption mechanism with example.

    ii) Explain principle, construction and working of Boy's calerimeter.

    iii) Explain the compossition, properties and applications of maild plain carbon steel.

Q.5) a) Explain the characteristics of good fuel   6

b) Solve any Two of the following   10

    i) Explain the vatious purposes of making alloys.

    ii) Explain cathodic protection of prevent metal from corrosion.

    iii) Compare properties of soild fuels with gaseass fuels.

Q.6) Solve any four of the following.   16

    a) Explain significance of green chemistry.

    b) Explain composition, properties and applications of nichrome.

    c) How Metals are protected by proper design and material selection.

    d) Explain metal spraying process.

    e) What are fuel cells? Give classification of fuel cells.

    d) Explain Gross calorifc value and net calorific value of fuel.

Total No. of Pages : 3

F.E. (All Branches) (Semester - I) Examination, December - 2018
ENGINEERING MATHEMATICS - I
Sub. Code : 59177

Day and Date : Saturday, 08 - 12 - 2018   **Total Marks : 100**
Time : 02.30 p.m. to 05.30 p.m.
Instructions : 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of non-programmable calculator is allowed.

SECTION - I

Q1) Attempt any three of the following :   **[15]**
a) Reduce matrix A to its normal form and hence find rank if

$$A = \begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & 7 \end{bmatrix}$$

b) Solve the equations if they are consistent
$x + 2y - 3z = -z;$ $3x - y + 4z = 3;$ $6x + 5y + z = -3.$
c) Apply matrix method to solve the equations
$x + 3y - 2z = 0;$ $2x - y + 4z = 0;$ $x - 11y + 14z = 0$
d) Find the values of λ for which following equations are consistent
$x + y + z = 1;$ $2x + y + 4z = \lambda;$ $4x + y + 10z = \lambda^2$

Q2) Attempt any three of the following :   **[15]**
a) Examine for dependence or independence of vectors
$[1\ 1\ -1\ 1];\ [1\ -1\ 2\ -1];\ [3\ 1\ 0\ 1]$
b) Find eigen vector for least eigen value of a matrix

$$A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$$

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c) Find eigen values of matrices $A^{-1};\ A^T;\ (Adj.\ A)$ and $(5A)$ if matrix

$$A = \begin{bmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{bmatrix}$$

d) Verify Caley-Hamilton's theorem for the matrix

$$A = \begin{bmatrix} 1 & 2 & 0 \\ 2 & -1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$$

Q3) Attempt any four of the following :   **[20]**

a) Prove that $\left(1 + i\sqrt{3}\right)^8 + \left(1 - i\sqrt{3}\right)^8 = (-2)^8.$

b) Prove that $\left[\dfrac{\sin(7\theta)}{\sin\theta}\right] = 7 - 56\sin^2\theta + 112\sin^4\theta - 64\sin^6\theta.$

c) Solve the equation and find all the roots $x^5 = (1 + i).$
d) Solve the equation $7\cos hx + 8\sin hx = 1.$

e) Prove that $\tanh^{-1}(z) = \dfrac{1}{2}\log\left(\dfrac{1+z}{1-z}\right).$

SECTION - II

Q4) Attempt any three of the following :   **[15]**
a) Expand $\log(1+\sin x)$ by Maclaurin's theorem in power of x.

b) Show that $e^{e^x} = e\left[1 + x + x^2 + \dfrac{5}{6}x^3 + \dfrac{5}{8}x^4 + \ldots\right].$

c) Expand $2x^3 + 7x^2 + x - 6$ in powers of $(x - 2)$.

d) Evaluate $\lim\limits_{x \to 1}\left[\dfrac{x}{x-1} - \dfrac{1}{\log x}\right].$

Q5) Attempt any four of the following :   [20]

a)   If $u = e^{yz}$; find $\dfrac{\partial^3 u}{\partial x \partial y \partial z}$

b)   If $z = f(x, y)$ and $x = uv$; $y = u^2 - v^2$, Prove that $2\left(u^2 + v^2\right)\dfrac{\partial z}{\partial y} = u\dfrac{\partial z}{\partial u} - v\dfrac{\partial z}{\partial v}$.

c)   If $y = x \cos u$ then find $\left(x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y}\right)$ and $\left(x^2\dfrac{\partial^2 u}{\partial x^2} + 2xy\dfrac{\partial^2 u}{\partial x \partial y} + y^2\dfrac{\partial^2 u}{\partial y^2}\right)$.

d)   If $x = r\cos\theta$, $y = r\sin\theta$; evaluate $\dfrac{\partial(x, y)}{\partial(r, \theta)}$ and $\dfrac{\partial(r, \theta)}{\partial(x, y)}$.

e)   Find the maximum and minimum values of $x^3 + 3xy^2 - 3x^2 - 3y^2 + 4$.

Q6) Attempt any three of the following :   [15]

a)   Solve the following system of equations by Gauss elimination method.

$3x - y + 2z = 12$, $x + 2y + 3z = 11$, $2x - 2y - z = 2$

b)   Solve the following system of equations by Jacobi's iteration method (Carry out 4 iterations)

$10x + y - z = 11.19$, $x + 10y + z = 28.08$, $-x + y + 10z = 35.61$

c)   Solve the following system of equations by Gauss-Seidal method (Carry out 4 iterations)

$8x - 3y + 2z = 20$, $4x + 11y - z = 33$, $6x + 3y + 12z = 35$

d)   Find the largest eigen value the matrix $A = \begin{bmatrix} 2 & 3 & 2 \\ 4 & 3 & 5 \\ 3 & 2 & 9 \end{bmatrix}$ by power method

with $X = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ as a base vector. (Carry out 3 iterations)

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