Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to University of Mumbai)

Re-exam

June 2015
Duration : 3 Hours

Total Marks : 100
CLASS/SEM : FE (C/E/M) SEM II
SUBJECT : ENGINEERING MECHANICS - II

- Attempt any FIVE questions out of SEVEN questions.
- If there are sub questions, **answers to all sub questions should be grouped together**.
- Figures to the right indicate full marks.
- Assume suitable data if necessary and state the same clearly.

Master

Q.1 (a) The acceleration of a particle as it moves along a straight line is given by (10)
$a = 2t - 1$
where a is m/s2 and t is in seconds. If s = 1 m and v = 2 m/s when t = 0,
determine the acceleration, velocity and position of the particle when t = 6 s.

Q.1 (b) A balloon starts moving upwards from the ground with a uniform acceleration of (10)
1.8 m/s². Five seconds later, a stone is thrown upwards from the same point with
a velocity of 20 m/s. Find when and where the stone meets the balloon. Neglect
air resistance.

Q.2 (a) Determine the acceleration of block A and the tension in the cables for the (10)
system if the system starts from rest. Coefficient of friction between the block A
and table as well as between blocks A & B is 0.3.
Take $m_A = 20$ kg, $m_B = 10$ kg, $m_C = 30$ kg
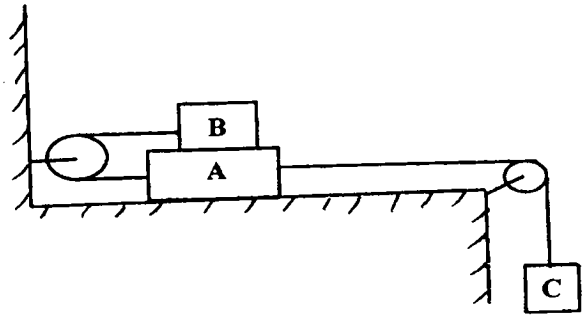
Q.2 (b) A particle undergoing simple harmonic motion has an amplitude of 0.1 m and a (04)
frequency of 2.5 Hz. Find the period of oscillation, maximum velocity and
maximum acceleration.

Q.2 (c) A car starts from rest on a curved road of radius 250 m and attains a speed of 18 (06)
kmph at the end of 60 seconds while travelling with uniform (tangential)
acceleration. Find the tangential, normal and total acceleration of the car 30
seconds after it started.
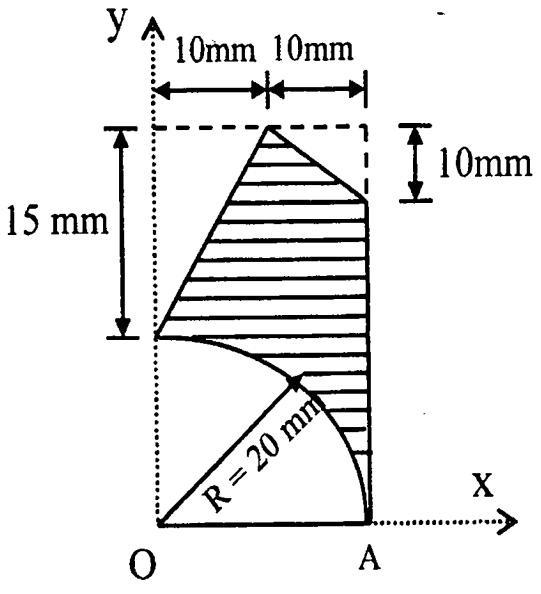
Q.3 (a) Find the centroid of the shaded area shown in figure below. (10)

Q.3 (b) Find the moment of inertia of the area shown in figure above in Q. 3 (a), about X (10)
and Y axes.

Q.4 (a) A ball 'A' of mass 100 gm moving horizontally with a velocity of 40 m/s hits a (10)
stationary block 'B' of mass 300 gm centrally as shown in figure below. If the
coefficient of restitution is 0.8, find the distance travelled by the block on a flat
horizontal rough surface with coefficient of kinetic friction 0.2.
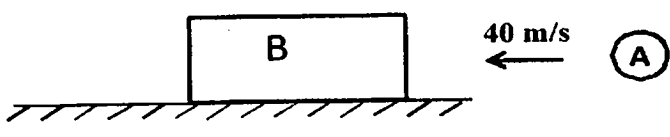
Q.4 (b) Block A of mass 20 kg is released from rest as shown in figure below. After (10)
sliding a distance of 0.8 m down the plane, the box compresses a spring of
stiffness k. If the maximum compression of the spring is 0.3 m, find the stiffness
of the spring. The coefficient of friction between block A and the plane is 0.2.
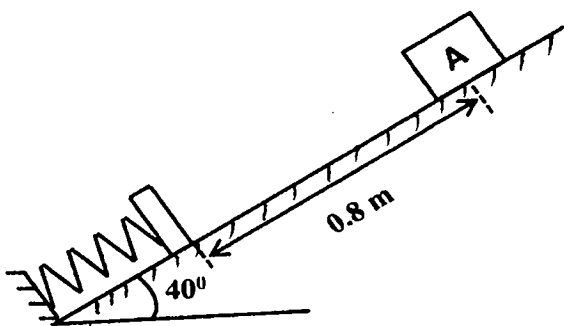
Q.5 (a) A projectile is fired with an initial velocity of 200 m/s at a target located at a (10)
horizontal distance of 3km and vertical distance of 500m. Determine the angle at
which the projectile should be fired.

Q.5 (b) The motion of a flywheel is given by the equation (10)
$\omega = 15 t^3 + 3t^2 - 2t + 1$ rad/sec. At t = 2 sec, its angular displacement is 120
radians. Find the angular acceleration, velocity and displacement at t=3 sec.

Q.6 (a) A rod AB moves so that point A travels horizontally to right with constant (08)
velocity of 10 m/s. Find the velocity of point B and the centroid of the rod and
also the angular velocity of the rod AB when $\theta = 60^0$. Length of rod is 4 m.
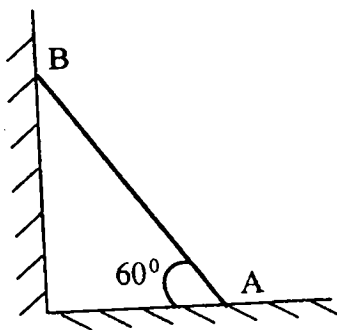
Q.6 (b) A slider mechanism is shown in figure below. Arm BC has an angular velocity (12)
of 4 r/sec clockwise when $\theta = 40^0$. Find the angular velocity of AB and the
velocity of points A and B.

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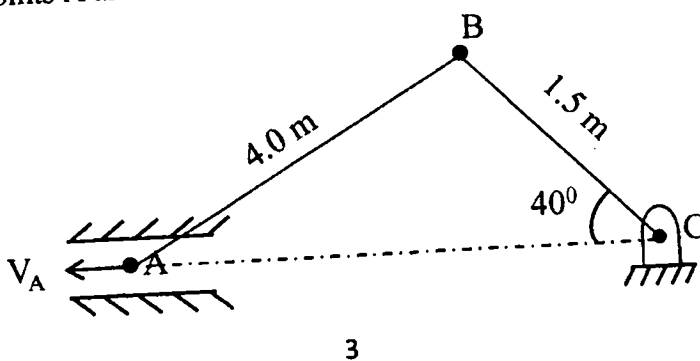
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Q.7 (a) A uniform bar of mass 12 kg and length 3 m is supported as shown in figure (10)
below. If the wire BC suddenly breaks, determine the acceleration of the end B
and the reaction at the pin support A.
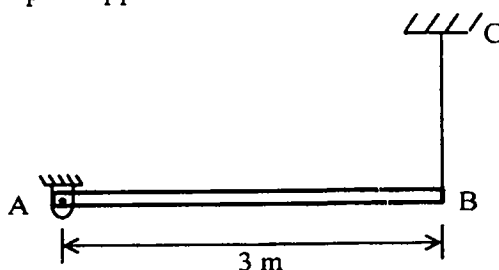
Q.7 (b) Two ships leave a port at the same time from the same place. The first ship A (10)
moves in north west direction at 30 km/hr and the second ship B moves in south
west direction at 60 km/hr. Find the relative velocity of ship B with respect to
ship A. Also find the distance between them after 25 minutes. After what time
interval will they be 40 km apart?

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Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to University of Mumbai)

May 2015
Duration : 3 Hours

Total Marks : 100
CLASS/SEM : FE (C/E/M) SEM II
SUBJECT : ENGINEERING MECHANICS - II

- Attempt any FIVE questions out of SEVEN questions.
- If there are sub questions, **answers to all sub questions should be grouped together.**
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- Assume suitable data if necessary and state the same clearly.

Master

Q.1 (a) A car moves along a straight road such that its velocity is described by the graph (10) shown in figure. For the first 10 seconds the velocity variation is parabolic and between 10 seconds to 30 seconds the variation is linear. Construct the s-t and a-t graphs for the time period $0 \leq t \leq 30s$.
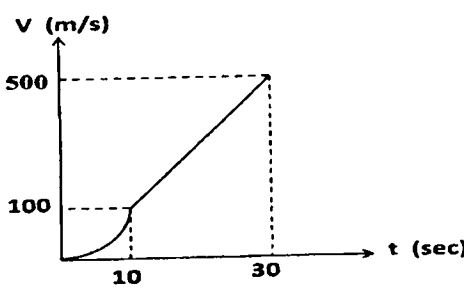
Q.1 (b) A stone A is thrown vertically upwards from the top of a tower with a velocity (10) of 25 m/s, the tower being 120 m high. After t seconds, another stone B is allowed to fall from the same point. Both the stones reach the ground simultaneously. Calculate t and the velocities of the stones A and B with which they reach the ground.

Q.2 (a) In the figure shown below, the pulleys are massless and the strings are (10) inextensible. Mass of block A is 2 kg, mass of block B is 4 kg and mass of block C is 6 kg. If the system is released from rest find the tension in each of the three strings and the acceleration of blocks A, B and C.

1

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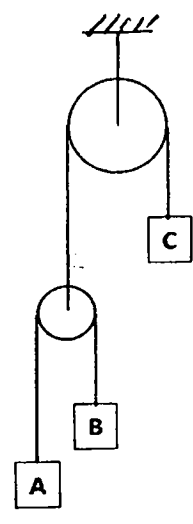
Q.2 (b) A particle undergoes simple harmonic motion. When it is 1m and 2m away from (10) the mean position, its velocities are 5 m/s and 3 m/s respectively. Find the maximum amplitude of oscillation, period of oscillation, maximum velocity and maximum acceleration.

Q.3 (a) Find the centroid of the shaded area shown in figure below. (10)

Q.3 (b) Find the moment of inertia of the area shown in figure above in Q. 3 (a), about X (10) and Y axes.

2
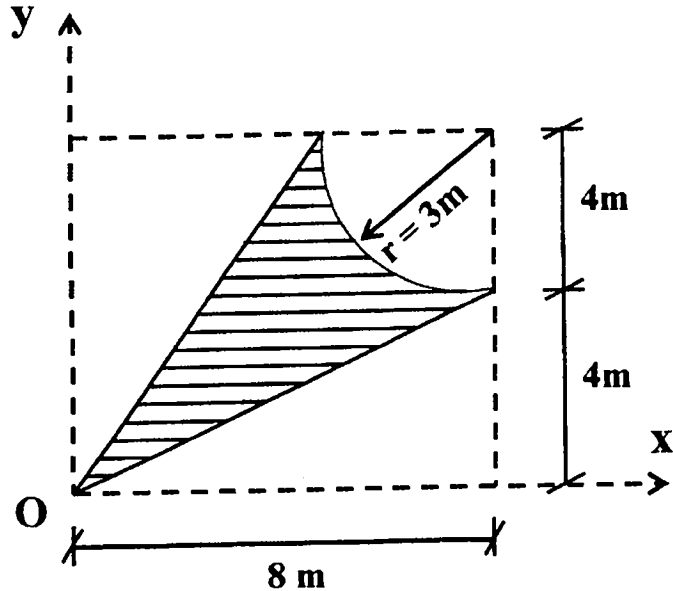
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Q.4 (a)   A sphere of mass 3 kg is released from rest. It strikes a block of mass 2 kg   (10)
resting on a horizontal surface as shown. Take e = 0.8. Determine how far the
block will move after impact, if μ = 0.2 between the block and the horizontal
surface.

Q.4 (b)   Block A of mass 300 kg and block B of mass 100 kg are connected by   (10)
inextensible cable and massless and frictionless pulley as shown in figure below.
Block A is having initial velocity of 2 m/s. Find its velocity after it travels 10 m
down the plane. Also find the velocity of block B. The coefficient of friction
between block A and the plane is 0.3.

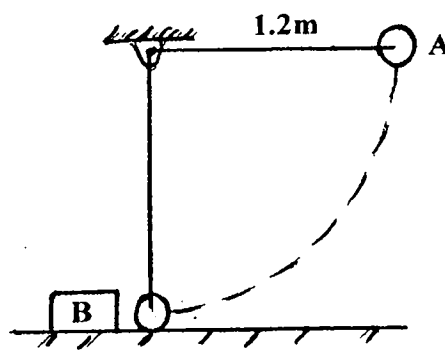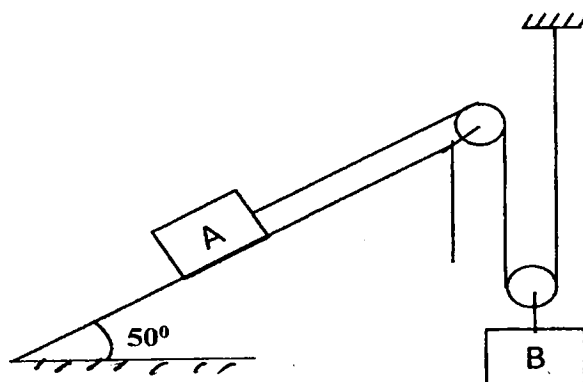Q.5 (a)   A ball is projected from the top of a tower of 60 m height with a velocity of 80   (10)
m/s and at an angle of elevation of 30° to the horizontal. Find
(i) the maximum height the ball will rise from the top of the tower
(ii) the horizontal distance it will travel just before it strikes the ground
(iii) the velocity with which it will strike the ground.

Q.5 (b)   The movement of a particle is governed by   (10)
$r = 2 t^2 i + 10 t j + t^3 k$
where r is in meters and t is in seconds. Determine the normal and tangential
components of acceleration and the radius of curvature of path traced at time t =
2 seconds.

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Q.6 (a)   A composite wheel shown in figure below rolls without slipping on the   (08)
horizontal plane with angular velocity of 50 r.p.m. clockwise. Determine the
velocities of points A and B.
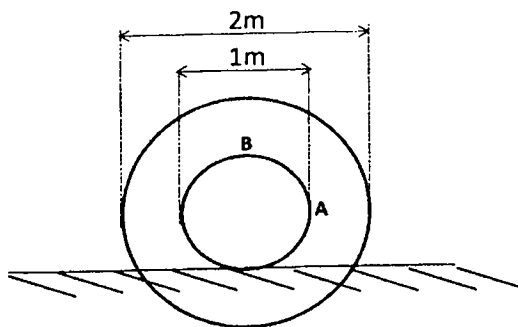
Q.6 (b)   A slider mechanism is shown in figure below. In the position shown, bar AB has   (12)
an angular velocity of 6 rad/s clockwise. Find the angular velocity of bar BC
and the velocity of slider C.
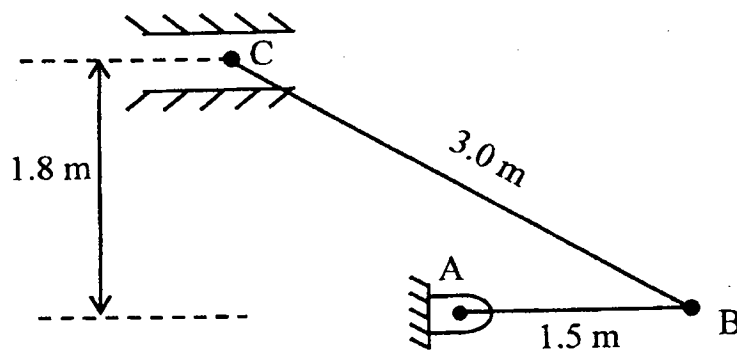
Q.7 (a)   Blocks A and B are connected by the inextensible strings passing over the   (10)
stepped pulley as shown in figure below. The mass of block A is 25 kg and mass
of B is15 kg. The mass of the stepped pulley is 12 kg and its radius of gyration is
100 mm. If the system is released from rest, find the angular acceleration of the
stepped pulley, accelerations of blocks A and B and the tensions in the strings
attached to A and B.

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BHARARATIYA VIDYA BHAVAN'S

SARDAR PATEL COLLEGE OF ENGINEERING

Munshi Nagar Andheri (West), Mumbai 400 058

(An Autonomous Institution Affiliated to University of Mumbai)

Re- Examination (June 2015)

CLASS/SEM: **FE (All branches) / II**
Subject: **Basic Electrical & Electronics Engineering II**

Total Marks: **100**
Duration   : **3 hour**

- Attempt any **5** out of **7** questions
- Answer to all sub questions should be grouped together.
- Assume suitable data where required.

Master.

Q.1	A) Derive the expression for the following parameters of half wave rectifier. (i) I_{LDC} (ii) I_{LRMS} (iii) P_{LDC} (iv) P_{AC} (v) Rectification efficiency	**(10)**
	B) Write short notes on LED & Photodiode.	**(10)**
Q.2	A) Determine the output voltage V_O for the circuit shown below. 	**(10)**
	B) Explain the construction, working and characteristics of SCR with suitable diagrams.	**(10)**
Q.3	A) Explain the operation of a full wave bridge rectifier with and without capacitive filter along with neat circuit diagrams and waveforms.	**(10)**
	B) Explain CB configuration of BJT with its circuit diagram and characteristics. Also write the expression for α and derive the expression for its output current.	**(10)**
Q.4	A) Simplify the following: (i) $Y = \overline{A}\,\overline{B}\,\overline{C} + \overline{A}\,B\,\overline{C} + A\,\overline{B}\,\overline{C} + A\,B\,\overline{C}$ (ii) $Y = ABC + A\,\overline{B}\,C + AB\,\overline{C}$	**(10)**
	B) State, explain and prove (with the help of truth table) the De Morgan's theorem.	**(10)**

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Q.5	A) Explain the OR and AND gates with the help of internal circuit diagrams and also write the output expressions and truth table for each.	**(10)**
	B) Explain the working of JFET with its drain and transfer characteristics. Show and explain I_{DSS} & V_{GSOFF}.	**(10)**
Q.6	A) Define the following: (i) Peak inverse voltage and Ripple factor (with respect to rectifiers) (ii) Latching current and holding current (with respect to SCR) (iii) Break down voltage (with respect to diodes)	**(10)**
	B) A crystal diode having internal resistance $R_f = 20\Omega$ is used for half wave rectifier. If the applied voltage is $v = 50\sin\omega t$ and load resistance $R_L = 800\Omega$. Find (i) I_m, I_{LDC}, I_{Lrms} (ii) ac power input and dc power output (iii) dc output voltage (iv) efficiency of rectification	**(10)**
Q.7	A) Explain the two transistor analogy of SCR	**(05)**
	B) Explain the three operating modes of Op-amp with neat circuit diagram.	**(09)**
	C) Explain the triggering methods of SCR in brief.	**(06)**

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BHARARATIYA VIDYA BHAVAN'S

SARDAR PATEL COLLEGE OF ENGINEERING

Munshi Nagar Andheri (West), Mumbai 400 058

(An Autonomous Institution Affiliated to University of Mumbai)

End Sem Examination

CLASS/SEM: **FE (C/M/E) / II**   Total Marks: **100**

Subject: **Basic Electrical & Electronics Engineering II**   Duration : **3 hour**

Date : **07/05/2015**

- Attempt any **five** out of the **seven** questions.
- Answer to all sub questions should be grouped together.
- Assume suitable data where required.   MASTER FILE.

Q.1	**A)** Explain the construction, working and characteristics of SCR with suitable diagrams.	**(10)**
	B) For the amplifier shown below, calculate the closed loop gain and output voltage. Assume op-amp is ideal.	**(10)**
Q.2	**A)** Explain the operating modes of op-amp with neat circuit diagrams	**(10)**
	B) Over what range of input voltage will the Zener circuit shown below maintain 30V across 2000Ω load assuming that series resistance is 200Ω and Zener current rating is 25mA?	**(07)**
	C) Convert the following binary into decimal numbers. (i) 110101 (ii) 1100.1011	**(03)**
Q.3	**A)** Explain the operation of a Zener diode as a voltage regulator with its characteristics.	**(05)**
	B) In a common base connection, $\alpha=0.95$. The voltage drop across 2 KΩ resistor which is connected in the collector is 2V. Find the base current.	**(05)**
	C) Explain the OR and AND gates with help of internal circuit diagrams and also write the output expression and truth table for each.	**(10)**

Q.4	**A)** Explain CB configuration of BJT with its circuit diagram and characteristics. Also write the expression for α and derive the expression for its output current.	**(10)**
	B) Simplify the following: (i) $AB + \overline{AC} + A\overline{B}C(AB+C)$ (ii) $A\overline{B}\overline{C} + A\overline{B}\overline{C}D + A\overline{C}$	**(10)**
Q.5	**A)** Draw the drain and transfer characteristics of JFET. Show I_{DSS} and V_{GSoff}. Explain how to calculate transconductance from the characteristics.	**(10)**
	B) Derive the expression for inverting and non-inverting op-amp with neat circuit diagrams.	**(10)**
Q.6	**A)** State, explain and prove (with the help of truth table) the De Morgan's theorem.	**(10)**
	B) For the combinational logic circuit shown below obtain the simplified output expression in terms of the given inputs.	**(05)**
	C) Explain the two transistor analogy of SCR.	**(05)**
Q.7	**A)** Define the following: (i) Peak inverse voltage and Ripple factor (with respect to rectifiers) (ii) Latching current and holding current (with respect to SCR) (iii) Break down voltage (with respect to diodes)	**(10)**
	B) A crystal diode having internal resistance $R_f = 20Ω$ is used for half wave rectifier. If the applied voltage is $v=50\sin\omega t$ and load resistance $R_L = 800Ω$. Find (i) I_m, I_{DC}, I_{rms} (ii) ac power input and dc power output (iii) dc output voltage (iv) efficiency of rectification	**(10)**

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to University of Mumbai)

June 2015

Re- Examination

Total Marks: **100**

Duration: **3 Hours**

CLASS/SEM: <u>**F.E (C/M/E)/II**</u>

SUBJECT: <u>**ENGINEERING MATHEMATICS II**</u>

- Attempt any FIVE questions out of SEVEN questions.
- Answers to all sub questions should be grouped together.
- Figures to the right indicate full marks.

Master

Q.1 (a) Find the length of the arc of the parabola $y^2 = 8x$ cut off by its latus rectum. **6**

(b) Solve $\left(D^4 + 8D^2 + 16\right)y = \cos^2 x$ **6**

(c) Using DUIS, Prove that $\int_0^\infty \dfrac{e^{-x} - e^{-ax}}{x \sec x}dx = \dfrac{1}{2}\log\left(\dfrac{a^2 + 1}{2}\right); (a \geq 0)$ **8**

Q.2 (a) Evaluate $\int_0^{a\sqrt{3}} \int_0^{\sqrt{x^2+a^2}} \dfrac{x}{x^2 + y^2 + a^2}dxdy$ **6**

(b) Solve $y\left(xy + 2x^2 y^2\right)dx + x\left(xy - x^2 y^2\right)dy = 0$ **6**

(c) State and prove duplication formula, **8**

Q.3 (a) Evaluate $\iiint (x + y + z)dxdydz$ over the tetrahedron bounded by the planes $x = 0, y = 0, z = 0$ **6** and $x + y + z = 1$

(b) Evaluate $\int_0^{\pi/2} \sqrt{\tan\theta}\,d\theta \cdot \int_0^{\pi/2} \sqrt{\cot\theta}\,d\theta$ **6**

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(c) Solve $x^3 \dfrac{d^3 y}{dx^3} + 2x\dfrac{dy}{dx} - 2y = x^2 + x - 1$ **8**

Q.4 (a) Solve $\left(\dfrac{\log y - 1}{\sqrt{x^2 + 1}} + x^3\right)dx + \dfrac{1}{y}\log\left(x + \sqrt{x^2 + 1}\right)dy = 0$ **6**

(b) Solve $(D^2 - 6D + 9)y = xe^{3x}\cos x$ **6**

(c) Solve $\left(x^2 - x\right)\dfrac{dy}{dx} + \left(1 - 2x\right)y + x^2 = 0$ **8**

Q.5 (a) Solve $(D^2 + a^2)y = \sec ax$ **6**

(b) Change to polar co-ordinates and Evaluate $\int_0^{2a} \int_0^{\sqrt{2ax - x^2}} (x^2 + y^2)dxdy$ **6**

(c) Evaluate $\iiint \dfrac{dxdydz}{\sqrt{a^2 - x^2 - y^2 - z^2}}$ over the first octant of the sphere $x^2 + y^2 + z^2 = a^2$ **8**

6(a) Prove that $\int_0^1 \dfrac{x^{m-1} + x^{n-1}}{(1+x)^{m+n}}dx = \beta(m,n)$ **6**

(b) Solve $\left(D^3 - 4D^2 - 3D + 18\right)y = e^{2x}\cosh x$ **6**

(c) Find the length of the loop of the curve $9ay^2 = (x - 2a)(x - 5a)^2$. **8**

7(a) Find the volume bounded by the cylinder $y^2 = x, x^2 = y$ and the planes $z = 0, x + y + z = 1$ **6**

(b) Evaluate $\iint xy(x + y)dxdy$, where R is the region bounded between $x^2 = y$ & $x = y$ **6**

(c) Find the length of the arc of the cardioide $r = a(1 - \cos\theta)$ which lies inside the circle $r = a\cos\theta$. **8**

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SARDAR PATEL COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to University of Mumbai)

May 2015

Total Marks: **100**   FE (C/M/E), Sem - II   Duration: **3 Hours**
Engineering Mathematics - II

CLASS/SEM: **F.E (C/M/E)/II**   SUBJECT: **ENGINEERING MATHEMATICS II**

- Attempt any FIVE questions out of SEVEN questions.
- Answers to all sub questions should be grouped together.   Master
- Figures to the right indicate full marks.

Q.1 (a)   Find the length of the arc of the parabola $x^2 = 6y$ cut off by its latus rectum.   6

(b)   Solve $\left(D^4 + 8D^2 + 16\right)y = \sin^2 x$ 6

(c)   Prove that $\int_0^\pi \dfrac{\log(1 + a\cos x)}{\cos x}dx = \pi \sin^{-1} a$, where $0 < a < 1$.   8

Q.2 (a)   Change the order of integration $\int_0^4 \int_{y/2}^{9-y} f(x,y)dxdy$ 6

(b)   Solve $\left(3y^3 + 3x^2 y\right)dx + \left(2x^3 + 12xy^2\right)dy = 0$ 6

(c)   State and prove duplication formula,   8

Q.3 (a)   Evaluate $\int_{-1}^2 \int_0^y \int_{x-y}^{x+y} (x + y + z)dxdydz$ 6

(b)   Evaluate $\int_0^\infty \dfrac{e^{-x^3}}{\sqrt{x}}dx \cdot \int_0^\infty y^4 e^{-y^6} dy$ 6

(c)   Solve $x^3 \dfrac{d^3 y}{dx^3} + 2x\dfrac{dy}{dx} - 2y = x^2 \log x$ 8

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Q.4 (a)   Solve $\left(\dfrac{\log y - 1}{\sqrt{x^2 + 1}} + x^3\right)dx + \dfrac{1}{y}\log\left(x + \sqrt{x^2 + 1}\right)dy = 0$ 6

(b)   Solve $(D^2 + 4D + 4)y = xe^{-2x}\sin x$ 6

(c)   Solve $\left(x^2 - x\right)\dfrac{dy}{dx} + (1 - 2x)y + x^2 = 0$ 8

Q.5 (a)   Solve $(D^2 + 3D + 2)y = \sin(e^x)$ 6

(b)   Evaluate $\int_0^2 \int_{\sqrt{2x-x^2}}^{\sqrt{4-x^2}} \dfrac{1}{\sqrt{4 - x^2 - y^2}} dxdy$ (change to polar co-ordinates)   6

(c)   Evaluate $\iiint_V xy^2 z\,dxdydz$ over the first octant of the sphere $x^2 + y^2 + z^2 = 2$ 8

6(a)   Prove that $\int_0^1 \dfrac{x^2}{\left(1 - x^4\right)^{1/2}}dx \cdot \int_0^1 \dfrac{1}{\left(1 + x^4\right)^{1/2}}dx = \dfrac{\pi}{4\sqrt{2}}$ 6

(b)   Solve $\left(D^3 - 4D^2 - 3D + 18\right)y = e^x \sinh 2x$ 6

(c)   Find the area common to the circle $r = a$ and the cardioide $r = a(1 + \cos\theta)$ 8

7(a)   Find the volume bounded by the cylinder $y^2 = x, x^2 = y$ and the planes $z = 0$, $x + y + z = 2$ 6

(b)   Evaluate $\int_0^2 \int_{\sqrt{2y}}^2 \dfrac{x^2}{\sqrt{x^4 - 4y^2}}dxdy$ 6

(c)   Find the length of the arc of the cardioide $r = a(1 - \cos\theta)$ which lies outside the circle $r = a\cos\theta$.   8

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SARDAR PATEL COLLEGE OF ENGINEERING

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May 2015

Total Marks: 100   Duration: **3 Hours**

CLASS/SEM: **F.E (C/M/E)/II**   SUBJECT: **ENGINEERING MATHEMATICS II**

- Attempt any FIVE questions out of SEVEN questions.
- Answers to all sub questions should be grouped together.
- Figures to the right indicate full marks.

Master

Q.1 (a) Find the length of the arc of the parabola $y^2 = 4ax$ cut off by the straight line $3y = 8x$.   **6**

(b) Solve $(D^3 - 7D - 6)y = x^2 e^{2x}$ **6**

(c) Using DUIS, Prove that $\displaystyle\int_0^{\pi/2} \frac{\log(1 + \cos\alpha \cos x)}{\cos x} dx = \frac{\pi^2}{8} - \frac{\alpha^2}{2}$ **8**

Q.2 (a) Change the order of integration and evaluate $\displaystyle\int_0^1 \int_0^{\sqrt{1-x^2}} \frac{e^y}{(e^y + 1)\sqrt{1 - x^2 - y^2}} dx dy$ **6**

(b) Solve $\dfrac{dy}{dx} = \dfrac{y+1}{(y+2)e^y - x}$ **6**

(c) Prove that $\displaystyle\int_0^1 \sqrt{1 - \sqrt{x}}\, dx \, . \, . \int_0^{1/2} \sqrt{2y - 4y^2}\, dy = \frac{\pi}{30}$ **8**

Q.3 (a) Find the length of the cardioide $r = a(1 - \cos\theta)$ **6**

(b) Evaluate $\displaystyle\int_0^\infty \sqrt{x}\, e^{-\sqrt[3]{x}}\, dx$ **6**

(c) Solve $(D^2 + a^2)y = \sec ax$ **8**

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Q.4 (a) Solve $\left(\dfrac{\log y - 1}{\sqrt{x^2 + 1}} + x^3\right) dx + \dfrac{1}{y}\log\left(x + \sqrt{x^2 + 1}\right) dy = 0$ **6**

(b) Solve $(D^3 + 4D)y = \sin x \cdot \cos 3x$ **6**

(c) Solve $\dfrac{dx}{dy} = e^{y-x}(e^y - e^x)$ **8**

Q.5 (a) Solve $(1+x)^2 \dfrac{d^2 y}{dx^2} + (1+x)\dfrac{dy}{dx} + y = \sin[\log(1+x)]$ **6**

(b) Evaluate $\displaystyle\int_0^a \int_0^{\sqrt{a^2 - x^2}} e^{-(x^2 + y^2)} dx dy$ (change to polar co-ordinates and evaluate)   **6**

(c) $\displaystyle\iiint \frac{1}{(1 + x + y + z)^3} dx dy dz$ over the tetrahedron bounded by the planes $x = 0$, $y = 0$, $z = 0$ and $x + y + z = 1$ **8**

6 (a) Prove that $\displaystyle\int_0^1 \frac{x^{m-1} + x^{n-1}}{(1+x)^{m+n}} dx = \beta(m, n)$ **6**

(b) Solve $(D^3 + 2D^2 - 5D - 6)y = e^{-x}\sinh 2x$ **6**

(c) Find the area common to the circle $r = a$ and the cardioide $r = a(1 + \cos\theta)$ **8**

7 (a) Solve $(2x \log x - xy)dy + 2y\, dx = 0$ **6**

(b) Evaluate $\displaystyle\iint y\, dx dy$ over the area bounded by $y = x^2$ and $x + y = 2$ **6**

(c) Solve $\sec^2 y \dfrac{dy}{dx} + 2 \tan x \cdot \tan y = \sin x$ **8**

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Bharatiya Vidya Bhavan's
SARDAR PATEL COLLEGE OF ENGINEERING
(An Autonomous Institution Affiliated to University of Mumbai)

<u>RE Exam(second half 2014-15)</u>

Sub: Computer Programming   Marks: 100

<u>F.E. (C/M/E) Sem II</u>   Duration: 3 hours

Master

- **Attempt any FIVE out of SEVEN questions.**
- Figures to the right indicate full marks.
- Assume suitable data wherever necessary.
- Group all the sub questions together.

1. a. Write a program to add two complex numbers using OOPs.   10

   b. What are the various visibility specifiers? When do we assign the protected   05
   visibility specifier to a class member?

   c. Explain inline functions with an example   05

2. a. Explain the following with example: 10
   Break
   continue

   b. Write a program to find Factorial of a number using Recursive function 10

3. Explain the following with an example   20

   i.   If- else statement

   ii.   switch statement

   iii. do – while loop

   iv.   for loop

   v.   while loop

4. a. Write a program to add two matrices.   10

   b. Write a program to count number of alphabets, space, numbers and special characters in a   10
   string.

Page 1

5. a. Write a program to find largest of 5 numbers using function.   10

   b. Write a program to search whether the particular element is present in the array or not. If   10
   present display how many times it is present in the array.

6. a. Explain the concept of local and global variables with an example.   10

   b. Write an algorithm and draw a flow chart to swap two numbers.   10

7. Write Short Note on any THREE   20

   i.   Static variable and static function
   ii.   Constructor Overloading
   iii. Inheritance
   iv.   Operator Overloading

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Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to University of Mumbai)

End Sem(second half 2014-15)

Sub: Computer Programming   Marks: 100

F.E. (C/M/E) Sem II   Duration: 3 hours   Master

- Q1 is **compulsory. Attempt any FOUR from remaining SIX.**
- Figures to the right indicate full marks.
- Assume suitable data wherever necessary.

1. a. Draw Flow Chart for the following :   04
        If the cost price and selling price of an item is input through the keyboard, determine
        whether the seller has made profit or loss. Also determine how much profit or loss he has
        made.

    b. Find output for the following   04

        i.   void f1()   ii. void main()
                                                   {
                {   int j=1;
                   static int i=3;   for(;j<=10;j++)
                   cout<< i++;   {
                   cout<<++i;   if(j%3==0)
                }   break;
                void main()   if(j%2==0)
                {   continue;
                   f1();   cout<<j;
                   f1();   }
                }   }

    c. What is constructor? List down the special characteristics of constructor.   04

    d. Write a program to swap two numbers using call by reference.   04

    e. Write a program to print the ASCII value of capital letter P.(use typecasting)   04

2. a. Explain how to call parameterized constructor of base class using object of derived   10
        class with an example.

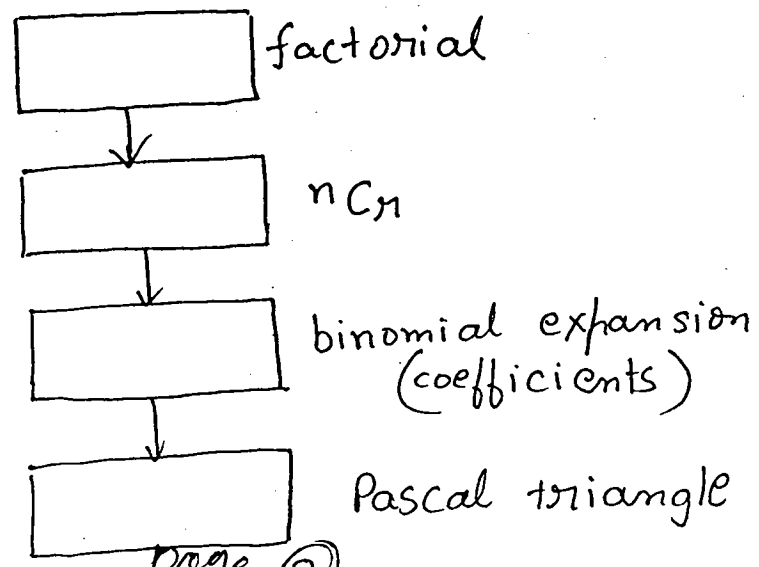   b. When is friend function compulsory? Give an example.   10

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3. a. Write a function power() to raise a number m to power n. The function takes a   10
        double value of m and int value of n and returns the value correctly. Use a default
        value of 2 for n to make the function calculate squares when n argument is omitted.
        Write a main function that gets the values of m and n from the user to test the
        functions. Use concept of function overloading.

    b. Explain run time polymorphism with an example.   10

4. a. Define a class compare. Use overloaded operator == to compare two strings.   10

    b. Write a program to enter a string and check whether it's a palindrome or not.   10

5. a. Write a program using functions to print the following patterns   10
            i.   1
                    2   2
                    3   3   3
                    4   4   4   4

            ii.   1   2   3   4
                    1   2   3
                    1   2
                    1

    b. Write short note on datatypes.   10

6. a. Write a program using OOPs to enter a number and find reverse of the number entered.   08

    b. Differentiate between while and do-while loop   02

    c. Write a program to find transpose of a matrix   10

7. Consider the multi level inheritance given below. Write a program to print the Pascal   20
    triangle upto 5th degree. The figure shows the function done by each class. Specify all class
    members as per the requirement

factorial

nCr

binomial expansion (coefficients)

Pascal triangle

page-②

Bhartiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous College Affiliated to University of Mumbai)

Engineering Graphics-II   Set (A)

End Semester – May 2015

Class: F.E. Mechanical (Set A)   **Total Marks: 100**
Subject: Engineering Graphics II   **Time: 3 Hrs**

Note:

1. Assume suitable data if necessary and clearly indicate the same.
2. Figures to right indicate full marks.
3. Save your work regularly.

Seat number	
Reg. No.	
Machine No.	
Sign of Invigilator	

Master

Q1a Draw the following orthographic projection views of **Figure 1A**
  a) Front View — 10
  b) Top View — 08
  c) Right Hand Side View — 07

OR

Q1b Draw the following orthographic projection views of **Figure 1B**
  a) Front View — 10
  b) Top View — 08
  c) Left Hand Side View — 07

Figure 1A   **Figure 1B**

Q2a Draw the following views of **Figure 2A**
  a) Sectional Front View along A-A — 10
  b) Top View — 08
  c) Left Hand Side View — 07

OR
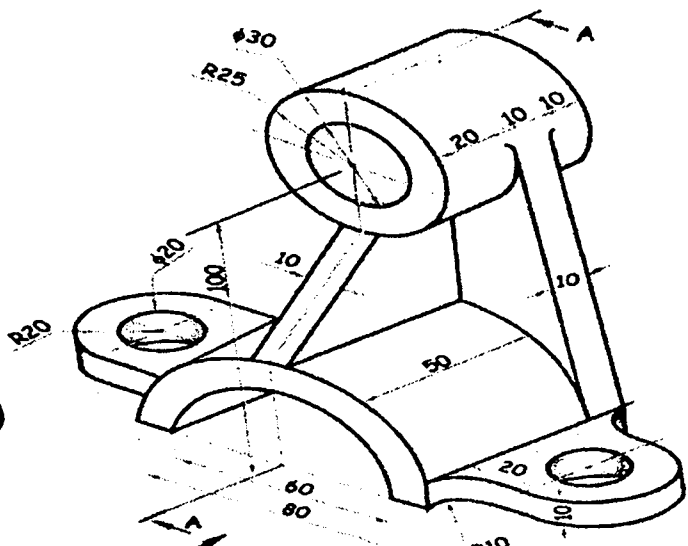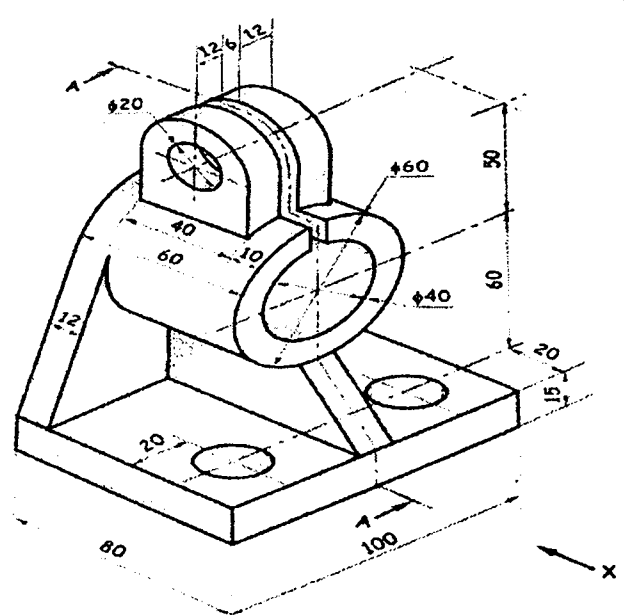
Q2b Draw the following of **Figure 2B**
  a) Sectional Front View A-A — 10
  b) Top View — 08
  c) Right Hand Side View — 07

Q3a 1) Draw Isometric View for **Figure 3A** — 20
  2) Draw two views each of any two types of Nuts. — 05

OR

Q3b 1) Draw Isometric View for **Figure 3B** — 20
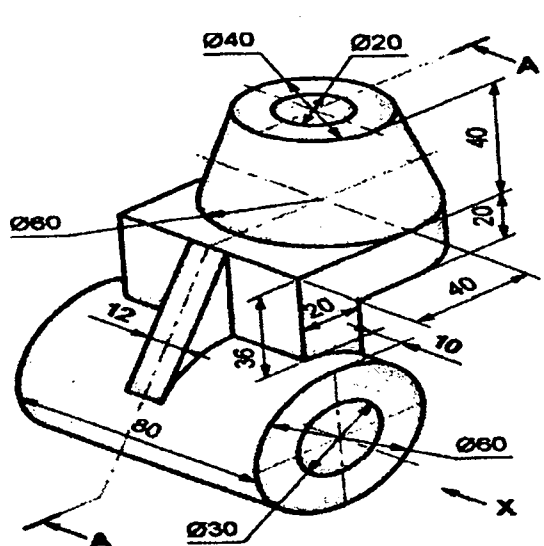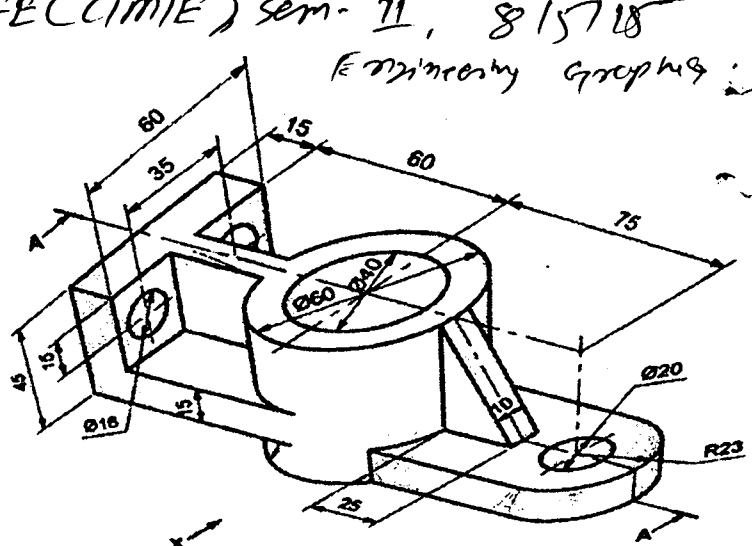 2) Draw two views each of any two types of Bolts. — 05

Page ①

Figure 2A   **Figure 2B**
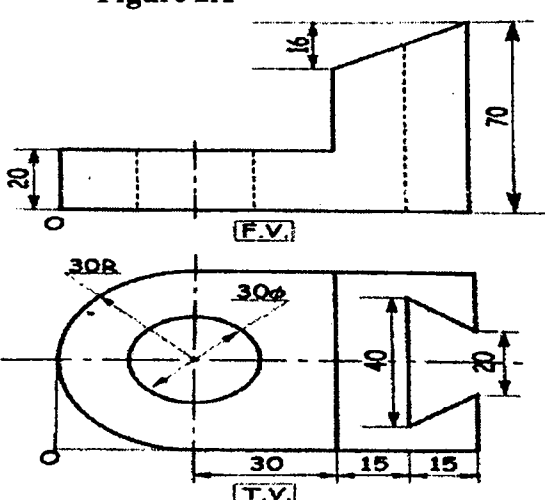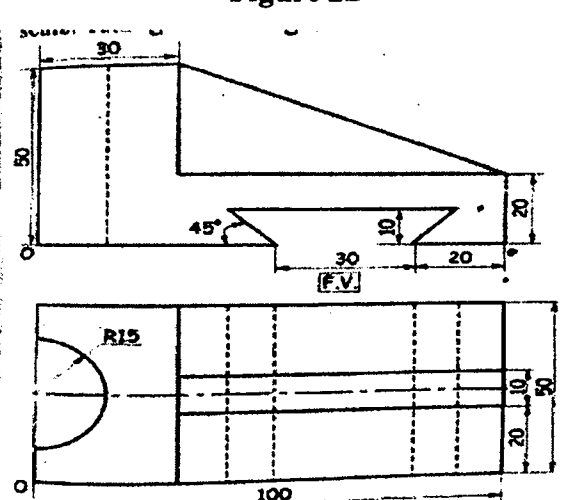
Figure 3A   **Figure 3B**

Q4a 1) Draw the following Views for **Figure 4A**
  a) Front View — 05
  b) Top View (Missing View) — 10
  c) Right Hand Side View — 05
  2) Draw one view each of any two types of Screws — 05

OR

Q4b 1) Draw the following Views for **Figure 4B**
  a) Front View — 05
  b) Top View (Missing View) — 10
  c) Left Hand Side View — 05
  2) Draw one view each of any two types of Studs. — 05

Figure 4A   *page ②*   **Figure 4B**

Bhartiya Vidya Bhavan's
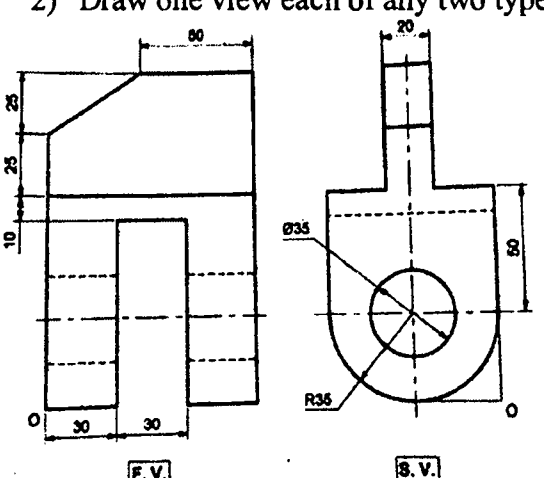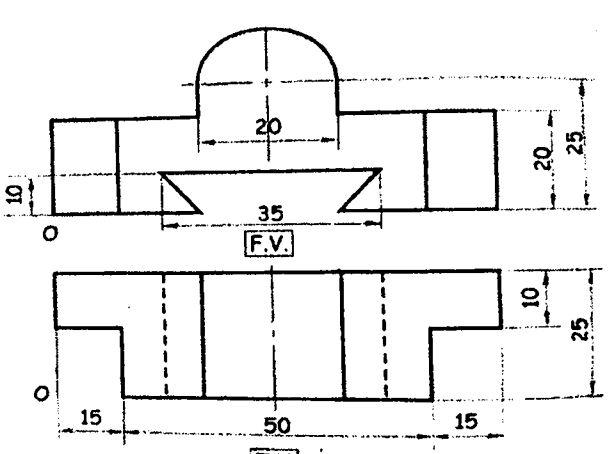
Sardar Patel College of Engineering

(A Government Aided Autonomous College Affiliated to University of Mumbai)

End Semester – May 2015 Engineering Graphics-II

Class: F.E. Mechanical (Set B)
Subject: Engineering Graphics II
Note:

Total Marks: 100
Time: 3 Hrs Set (B)

Seat number	
Reg. No.	
Machine No.	
Sign of Invigilator	

1. Assume suitable data if necessary and clearly indicate the same.
2. Figures to right indicate full marks.
3. Save your work regularly.

Q1a Draw the following orthographic projection views of **Figure 1A**   Staff
    a) Front View   10
    b) Top View   08
    c) Right Hand Side View   07

OR

Q1b Draw the following orthographic projection views of **Figure 1B**
    a) Front View   10
    b) Top View   08
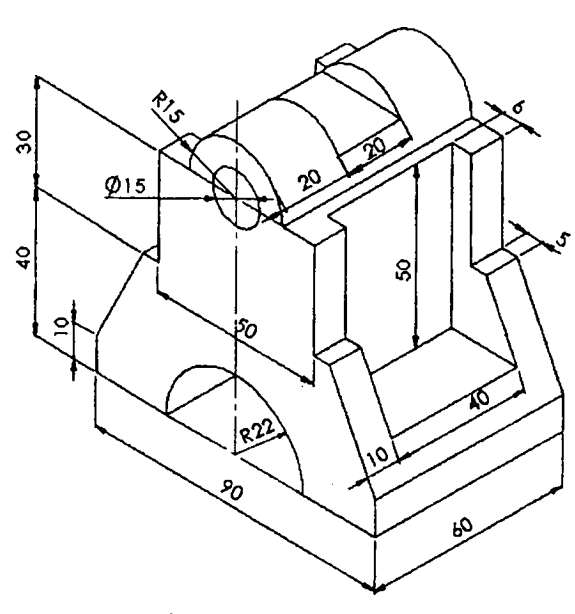   c) Left Hand Side View   07

Figure 1A
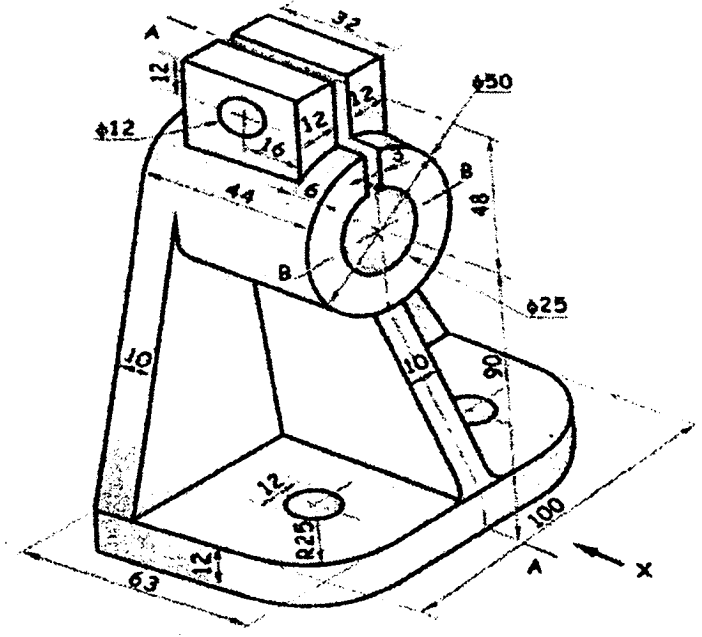
Figure 1B

Q2a Draw the following views of **Figure 2A**
    a) Sectional Front View along A-A   10
    b) Top View   08
    c) Left Hand Side View   07

OR

Q2b Draw the following of **Figure 2B**
    a) Sectional Front View along A-A   10
    b) Top View   08
    c) Left Hand Side View   07

Q3a 1) Draw Isometric View for **Figure 3A**   20
    2) Draw two views each of any two types of Bolts.   05

OR

Q3b 1) Draw Isometric View for **Figure 3B**   20
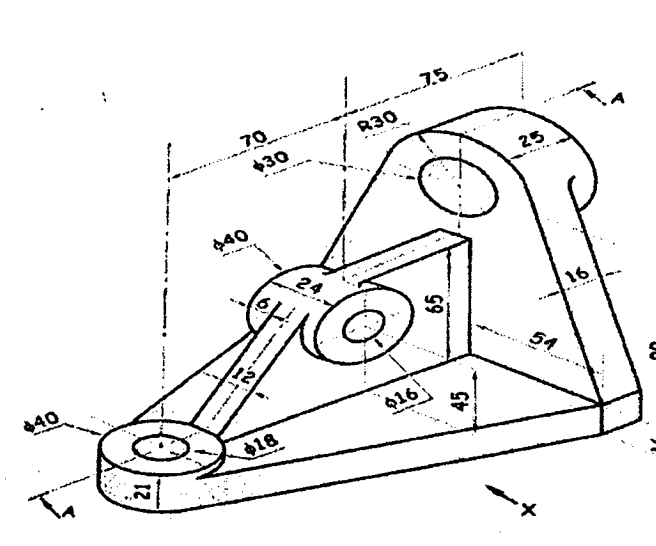   2) Draw one view each of any two types of Screws   05
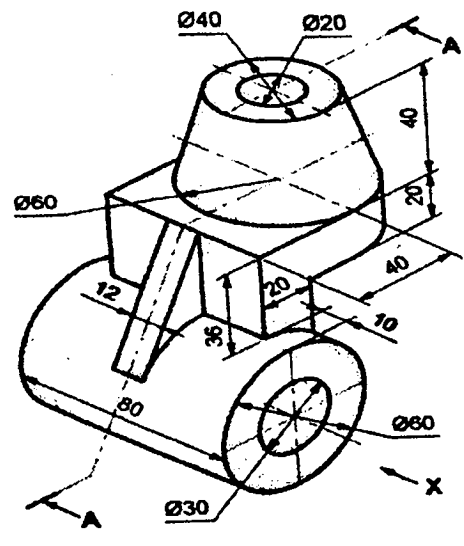

Figure 2A

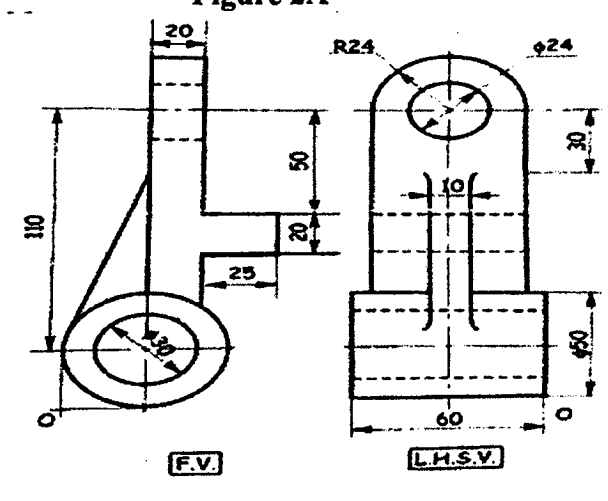**Figure 2B**
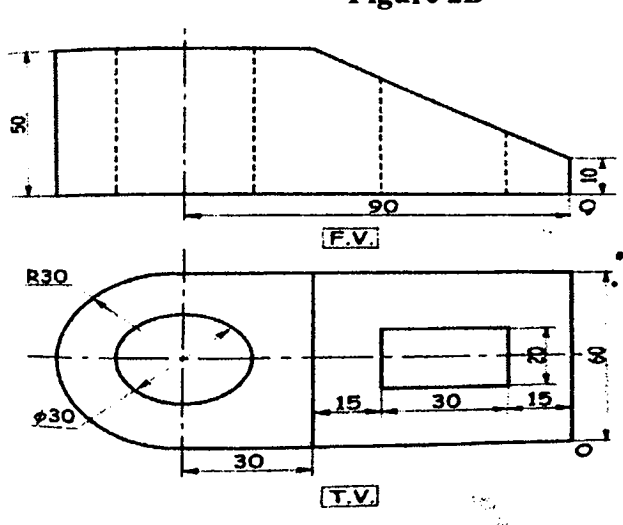
Figure 3A

Figure 3B

Q4a 1) Draw the following Views for **Figure 4A**
    a) Front View   05
    b) Top View   05
    c) Left Hand Side View (Missing Views)   10
    2) Draw two views each of any two types of nuts   05

OR

Q4b 1) Draw the following Views for **Figure 4B**
    a) Front View   05
    b) Top View (Missing Views)   10
    c) Left Hand Side View   05
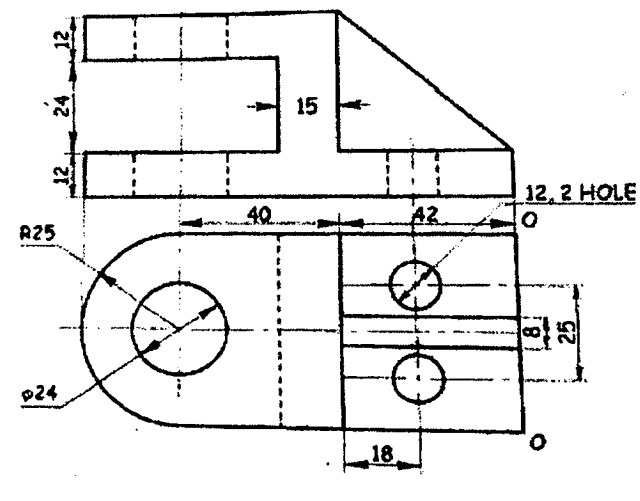   2) Draw one view each of any two types of Studs.   05

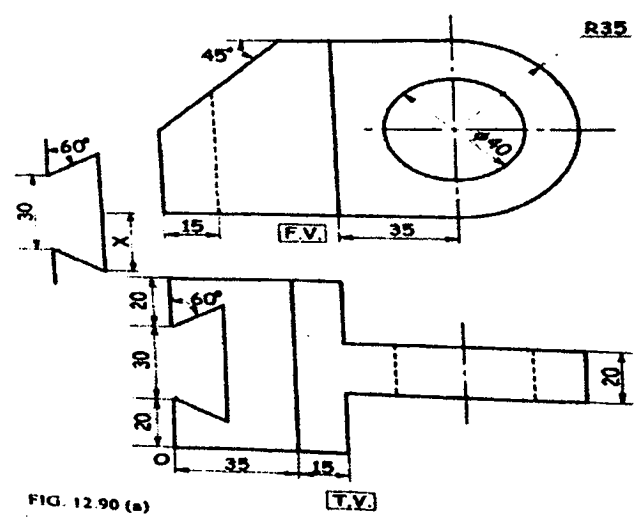FIG. 12.90 (a)

Figure 4A

Figure 4B

Bharatiyavidyabhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

[An autonomous institution Affiliated to university of Mumbai]

REXAM (SEM II)EXAMINATION FOR F.E.(C/M/E) JUN 2015

Total marks : 75   duration : 3 hr

Subject : Applied Physics(Sem-II)

- ➤ Attempt any **five** questions.
- ➤ Draw diagrams and assume suitable data wherever necessary.
- ➤ Figure to right indicates full marks.   Master

Q1. **Answer anyfive.**   [5*3=15]

a) State the fundamental postulates of special theory of relativity? Give an example of inertial frame of reference?

b) Find the net charge of the surface of length 'a' and width 'b' having surface charge density $\sigma = \sigma_o * x/a * y/b$?

c) The susceptibility of paramagnetic material is $3.7 * 10^3$ at $27°C$? What will be the value of its susceptibility at $200°K$ and $500°K$?

Q2.   [7+7+1]

a) Differentiate electric circuit and magnetic circuit and hence define Reluctance ,Permeance and Magnetic field intensity with their respective units?

b) Find the electric field at a distance 'z' above the center of circular loop of radius r which carries a uniform line charge λ?
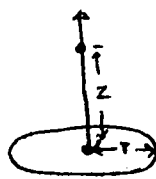
c) If 'r' is the radius of the HCP crystal the height of the unit cell of HCP crystal is____?

Q3   [7+7+1]

a) Describe diamagnetic , paramagnetic & ferromagnetic material ?explain their classification on the basis of permanent magnetic moment?

b) Deduce the Lorentz transformation equation of space and time?

c) Can X-rays of wavelength greater than 2d be diffracted from the crystal having interplanar spacing as 'd'?

Q4   [7+7+1]

a) How are characteristics X- rays produced ? Explain the characteristics X-rays spectrum.

b) Explain with neat sketch diamond crystal? And find out its parameter Z , CN, Atomic radius, APF?

c) State fundamental theorem for Curl?

Q5   [7+7+1]

a) Find the magnetic field at a distance 'a' from a long distance finite wire carrying a steady current I ?

b) The radiation of X-ray tube operated at 50 KV are diffracted by simple cubic KCL crystal structure of weight 74.6 and density $1.99 * 10^3$ kg/m^3. Calculate the shortest possible wavelength of the spectrum from the tube and glancing angle from first order reflection from the reflecting plane (1 1 1) ?

c) What is the relation between relative permeability and susceptibility?

Q6   [7+7+1]

a) A rocket leaves the earth at a speed of 0.6c , a second rocket leaves the first at a speed of 0.8c with respect to the first . calculate the speed of the second rocket with respect to the earth if

      i)   It is fixed in a direction opposite to the first?

      ii)   It is fired in the same direction as the first one?

b) Define APF & Co-ordination no. hence find the same for FCC?

    A certain crystal has axial unit x:y:z of 0.424:0.183:1 find out the miller indices of crystal faces whose intercepts are 0.212:0.183:1?

c) Draw crystal plane in unit cubic crystal structure having miller indices (030)

Q7. [7+7+1]

a) Define diffraction? Deduce Bragg's law for x rays diffraction?

b) Define Bravias lattice? Find out total number of bravias lattice in 2D exists by rotation symmetry?

c) According to theory of relativity, which quantities are variant (any four)?

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Bharatiya Vidya Bhavan's
SARDAR PATEL COLLEGE OF ENGINEERING
(An Autonomous Institution Affiliated to University of Mumbai)
2014-15
Sem II
ATKT Examination for F.E (Civil/Mechanical/Electrical)
APPLIED SCIENCES-II

CLASS/SEM: **F.E. (C/M/E) Sem.-II**   **June 2015**

SUBJECT : APPLIED PHYSICS-II

Time: $1\frac{1}{2}$ Hr.

Marks: 50

Answers to all sub questions should be grouped together. Assume suitable data (if necessary) and state the assumption/s clearly. Diagrams have to be drawn wherever necessary.
Some fundamental constants:

$e=1.6\times10^{-19}$C, $N_A=6.023\times10^{23}$/gm-mole, $h=6.63\times10^{-34}$J-s, $c=3\times10^{8}$m/s, $m_e=9.11\times10^{-31}$kg, $\mu_B=9.27\times10^{-24}$A-m^2, $\mu_o=4\pi\times10^{-7}$Wb/A-m, $k_B=1.38\times10^{-23}$J/K.

Good luck!

Answer any five. [6 marks for (a) and 4 marks for (b)]

Q1.

(a) Explain: (i) Magnetic flux density, (ii) External magnetic field strength, (iii) Magnetisation, (iv) Absolute permeability, (v) Relative permeability, (vi) Susceptibility.

(b) Find the atomic density in (100), (110) and (111) planes of SC structures.

Q2.

(a) Draw neat diagrams to indicate Miller indices of the important plane orientations in FCC crystals. Obtain interplanar spacing ratios for the above crystal planes.

(b) Given: $\vec{E} = kr^{-3}\hat{r}$ in a spherical distribution that has radius r where k is a constant. Find:
(i) charge density ρ and (ii) q_{enc} assuming charges to be kept at the origin.

Q3.

(a) Write a short note on HCP crystal structure giving details about its (i) average number of atoms in unit cell, (ii) Co-ordination number and (iii) Atomic Packing Factor.

(b) An iron rod 0.5 m long and 2mm^2 cross section is placed in a long solenoid of 25turns per cm carrying current of 2A. Assuming the relative permeability of iron to be 400, find magnetic moment of the bar.

Q4.

(a) Explain hysteresis in ferromagnetic materials by hysteresis curve and hence define important aspects of the curve.

(b) A beam of X-rays is incident on an NaCl crystal with density 2180kg/m^3. Atomic weights of Na and Cl are 23 and 35.5 respectively. First order Bragg reflection is observed at glancing angle of 8°35 from its (110) plane. What is the wavelength of X-rays?

Q5.

(a) How are continuous and characteristic X-rays produced? Derive an expression for definite minimum wavelength in continuous X-ray spectrum.

(b) Given a vector potential $\vec{A}(r) = -\frac{1}{2}(\vec{r} \times \vec{B})$ where $\vec{r}$ is position vector and $\vec{B}$ is the magnetostatic field. Find: $\vec{\nabla} \bullet \vec{A}$ and $\vec{\nabla} \times \vec{A}$.

Q6.

(a) Prove that : $\vec{\nabla} \times \vec{E} = 0$ where $\vec{E}$ is an electrostatic field.

(b) A paramagnetic salt that contains 10^{28}ions/m^3 has a paramagnetic susceptibility of 78.5x10^{-8} at 20°C. Calculate the magnetic moment of the ions in terms of Bohr magneton.

Q7.

(a) State and explain fundamental theorems of divergence, gradients and curls.

(b) The Curie temperature of iron is 1043K. Calculate the (a) saturation magnetization and (b) Weiss field constant assuming there are 10^{28} atoms/m^3 having moments of two Bohr magneton per atom.

Bharatiya vidya bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

[An autonomous institution Affiliated to university of Mumbai]

END (SEM-II)-EXAMINATION FOR F.E.(C/M/E) _APR 2015

Total marks : 75   duration : 3 hr

Subject : Applied Physics(Sem-II)

- ➤ **Question No. 1** is compulsory.
- ➤ Attempt any **Four** out of remaining **Six** questions.
- ➤ Draw diagrams and assume suitable data wherever necessary.
- ➤ Figure to right indicates full marks.

Master

Q1. **Answer any three** .   [5*3=15]

a) Show that time for moving observer moves slowly?

b) The height of a certain hill (in feet) is given by

$h(x,y)= 10(2xy - 3x^2 - 4y^2 - 18x + 28y + 12)$.

Where y is the distance (in miles) north, x is the distance east of South Hadley. Where is the top of hill located and how high is the hill?

c) Derive c/a ratio of HCP structure and hence find its volume?

d) Diamagnetic material is subjected to external magnetic field of 10^5 A/m. Evaluate magnetization and magnetic flux density of diamagnetic material? (Susceptability of diamagnetic material = $5*10^{-5}$)

### Answer any four

Q2   [7+7+1]

a) Find potential inside and outside of uniformly charged solid sphere whose radius is R & whose total charge is Q. (use infinity as your reference point)

b) Explain with definition , unit and notation 1) Magnetic permeability.

                            2) Magnetic flux density.

                            3) Hysterisis loop on the basis of domain theory.

page①

C) Find miller indices of given crystal plane.

[Take this as corner as a origin]

[unit cube] →
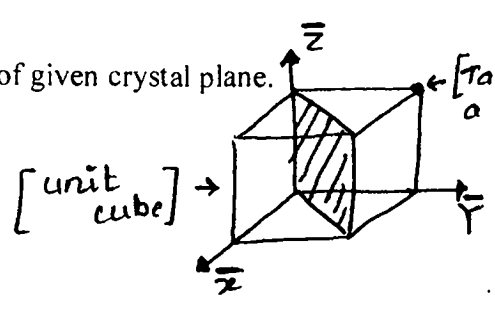
Q3.   [7+7+1]

a) Find velocity of body in moving frame w.r.t. observer at rest ? and hence show that if a photon is travelling along y-direction in moving frame with the speed 'c' then it should be invariant(constant) w.r.t. observer at rest?

b) Define Miller Indices and Interplanar distance? Deduce a relation between interplanar spacing in cubic crystal and lattice constant?

$$d = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

c) Two photon approach each other. Their relative velocity will be____

Q4   [7+7+1]

a) Write down properties of x ray(any six)?and draw schematic diagram of modern x- ray tube designed by Coolidge and write down parts of x-ray tube?

b) Calculate atomic radius of Fe which has BCC structure. Given that density of iron 7.86 gm/cm³ and atomic weight = 55.85?

c) Find net flux through the curve surface in the given system?

← [direction of $\vec{E}$]
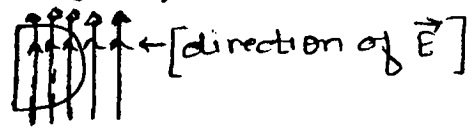
Q5   [7+7+1]

a) In the given magnetic system two sides are thicker than the other two sides. The depth of the core is 5 cm , Relative permeability of the core is 500, No of turns = 250 and the current flowing through the coil is 1 amp

    1) Determine the flux in the core?

    2) Find current i in the coil to produce a flux (ϕ=0.012 Wb)?
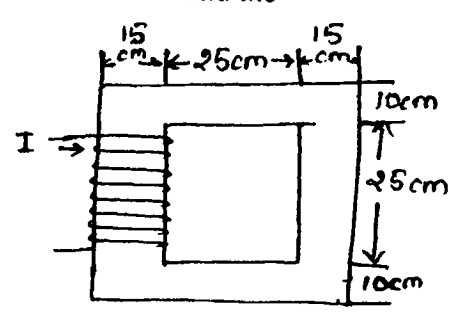
page ②

b) Show that total energy of freely moving body consist of its rest energy plus its energy due to motion?

c) What is gyromagnetic ratio?

Q6

[7+7+1]

a) A steady current I is uniformly distributed over solid cylindrical wire of radius 'a'. Find the magnetic field both inside and outside the wire?

b) Describe Bragg's x-rays spectrometer with neat labeled diagram?

c) Write down Bragg's law for 3rd order reflection?

Q7

[5*3=15]

a) State gauss law in integral form and hence derive differential form of gauss law?

b) An X- ray tube operates at 40 KV emits continuous x- ray spectrum with a short wavelength limit of 0.31 $\overset{\bullet}{A}$. Calculate Planck's constant?

c) Two space craft A and B moving away from each other with the speed of 0.9c and 0.7c respectively .the relative speed of space craft as observed by the observers in the two crafts will be nearly equal to?

page (3)

Bharatiya Vidya Bhavan's   *Applied Chemistry*

SARDAR PATEL COLLEGE OF ENGINEERING
(An Autonomous Institution Affiliated to University of Mumbai)

APPLIED CHEMISTRY – II   FE (C/M/E): 2014-15

Duration :   **(50 MARKS)**   SEM-II: KT-exam

- **Question No. 1 is compulsory.**
- Attempt any four questions out of remaining.
- Assume any other data needed suitably if not given; but justify the same.
- Illustrate your answers with neat diagram.

Q.1 (a) Describe in detail Duralium alloy.   05

  (b) Explain in detail essential components of composite material.   05

Q.2 (a) A gaseous fuel has the following composition by volume, H_2 =35%, CH_4 = 45%, C_2H_6 = 6%, CO   05
= 12% and remaining is % N_2. Calculate the minimum amount of air required at 27 ^{0}C and 760
mm Hg pressure for the complete combustion of $3M^3$ of fuel.

  (b) Explain in detail sandwich panel structural composite.   05

Q.3 (a) Explain importance of green chemistry.   05

  (b) A coal sample contain C = 85%, H = 5%, O = 5%, S = 2% and ash = 3%. Calculate the minimum   05
amount of air by weight and by volume required for complete combustion of 5 Kg of fuel.

Q.4 (a) Describe in detail functions of matrix in composite material.   05

  (b) Explain in detail estimation of %S by ultimate analysis.   05

Q.5 (a) Describe in detail woods metal alloy.   05

  (b) 1.5 g of coal sample was taken for %C and %H estimation by combustion method. The increase   05
on weight of tube containing anhydrous $CaCl_2$ and bulb containing KOH was found to be 1.25 g
and 4.88 g respectively. Calculate the % C and % H for give coal sample.

Q.6 (a) Give any five points of differences between liquid phase and vapour phase thermal cracking   05
process.

  (c) 1.95 g of coal sample was taken for nitrogen estimation by Kjeldahl method. The ammonia   05
liberated required 9.6 mL of 0.5 N H_2SO_4 for neutralization. The same sample weighing 1.5 g in
Bomb calorimeter experiment produced 0.25 g of $BaSO_4$. Calculate % N and % S for given coal
sample.

Q.7 (a) Explain in detail galvanization.   05

  (b) Explain in detail fixed bed catalytic cracking process.   05

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Bharatiya Vidya Bhavan's **Applied Chemistry - II**

SARDAR PATEL COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to University of Mumbai)

APPLIED CHEMISTRY – II
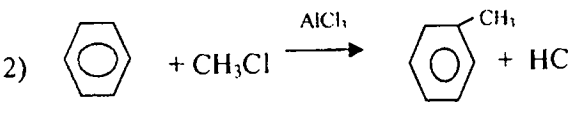
Duration :

(75 MARKS)

FE (C/M/E): 2014-15

SEM-II: Re-exam

- **Question No. 1 is compulsory.**
- Attempt any four questions out of remaining.
- Assume any other data needed suitably if not given; but justify the same.
- Illustrate your answers with neat diagram.

Q.1 (a) Describe in detail Duralium alloy. — 05

(b) Explain in detail fractional distillation of crude petrol. — 05

(c) Explain in detail essential components of composite material. — 05

Q.2 (a) A gaseous fuel has the following composition by volume, H_2 =35%, CH_4 = 45%, C_2H_6 = 6%, CO = 12% and remaining is % N_2. Calculate the minimum amount of air required at $27\ ^0C$ and 760 mm Hg pressure for the complete combustion of $3M^3$ of fuel. — 05

(b) Explain in detail sandwich panel structural composite. — 05

(c) Give in detail Galvanization process — **05**

Q.3 (a) Explain importance of green chemistry. — 05

(b) Describe in detail pitting corrosion mechanism. — 05

(c) A coal sample contain C = 85%, H = 5%, O = 5%, S = 2% and ash = 3%. Calculate the minimum amount of air by weight and by volume required for complete combustion of 5 Kg of fuel. — 05

Q.4 (a) A coal sample has the following composition by mass, C = 75%, H = 7%, O = 3%, S = 3 and remaining % ash. Calculate Gross and net calorific value using Dulong's formula. — 05

(b) Describe in detail functions of matrix in composite material. — 05

(c) Explain in detail estimation of % S by ultimate analysis. — 05

Q.5 (a) Explain in detail estimation of % N by ultimate analysis. — 05

(b) Describe in detail woods metal alloy. — 05

(c) 1.5 g of coal sample was taken for %C and %H estimation by combustion method. The increase on weight of tube containing anhydrous $CaCl_2$ and bulb containing KOH was found to be 1.25 g and 4.88 g respectively. Calculate the % C and % H for give coal sample. — 05

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Q.6 (a) Give any five points of differences between liquid phase and vapour phase thermal cracking process. — 05

(b) Describe in detail biodiesel. — 05

(c) 1.95 g of coal sample was taken for nitrogen estimation by Kjeldahl method. The ammonia liberated required 9.6 mL of 0.5 N H_2SO_4 for neutralization. The same sample weighing 1.5 g in Bomb calorimeter experiment produced 0.25 g of $BaSO_4$. Calculate % N and % S for given coal sample. — 05

Q.7 (a) Explain in detail galvanization. — 05

(b) Explain in detail fixed bed catalytic cracking process. — 05

(c) Calculate the % atom economy for the following reactions. — 05

1) $CH_3\text{-}CH=CH_2 + Cl_2 \longrightarrow Cl\text{-}CH_2\text{-}CH=CH_2 + HCl$

2) $+ CH_3Cl \xrightarrow{AlCl_3}$ $+ HCl$

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Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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APPLIED CHEMISTRY – II

Duration :

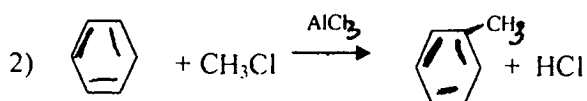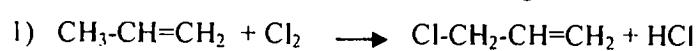### (75 MARKS)

FE (C/M/E)
SEM-II (2014-15)

- **Question No. 1 is compulsory.**
- Attempt any four questions out of remaining.
- Assume any other data needed suitably if not given; but justify the same.
- Illustrate your answers with neat diagram.

Master

Q.1 (a)	Describe in detail Galvanic corrosion with suitable example.	05
(b)	Explain in detail fractional distillation of crude petrol.	05
(c)	Explain in detail matrix phase of composite material.	05
Q.2 (a)	Give any five principles of green chemistry.	05
(b)	Describe in detail intergranular corrosion mechanism.	05
(c)	A coal sample contain C = 85%, H = 5%, O = 5%, S = 2% and ash = 3%. Calculate the minimum amount of air by weight and by volume required for complete combustion of 2 Kg of fuel.	05
Q.3 (a)	A coal sample has the following composition by mass, C = 85%, H = 7%, O = 3%, S = 3.5%, N = 2.1% and ash = 4.4%. Calculate Gross and net calorific value using Dulong's formula.	05
(b)	Give any five applications of composite material.	05
(c)	Explain in detail estimation of % C and % H by ultimate analysis.	05
Q.4 (a)	Explain any five application of powder metallurgy.	05
(b)	Describe in detail woods metal alloy.	05
(c)	1.5 g of coal sample was taken for %C and %H estimation by combustion method. The increase on weight of tube containing anhydrous CaCl$_2$ and bulb containing KOH was found to be 1.25 g and 4.88 g respectively. Calculate the % C and % H for give coal sample.	05
Q.5 (a)	A gaseous fuel has the following composition by volume, H$_2$ =35%, CH$_4$ = 45%, C$_2$H$_6$ = 6%, CO = 12% and remaining is % N$_2$. Calculate the minimum amount of air required at 27 ^{0}C and 760 mm Hg pressure for the complete combustion of 1M^3 of fuel.	05
(b)	Explain in detail sandwich panel structural composite.	05
(c)	Give in detail Galvanization process.	05
Q.6 (a)	Give any five points of differences between liquid phase and vapour phase thermal cracking process.	05
(b)	Describe in detail power alcohol.	05
(c)	1.95 g of coal sample was taken for nitrogen estimation by Kjeldahl method. The ammonia liberated required 9.5 mL of 0.4 N H$_2$SO$_4$ for neutralization. The same sample weighing 1.5 g in Bomb calorimeter experiment produced 0.35 g of BaSO$_4$. Calculate % N and % S for given coal sample.	05

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Q.7 (a)	Explain in detail metal cladding process.	05
(b)	Explain in detail moving bed catalytic cracking process.	05
(c)	Calculate the % atom economy for the following reactions.	05

1) CH$_3$-CH=CH$_2$ + Cl$_2$ $\longrightarrow$ Cl-CH$_2$-CH=CH$_2$ + HCl

2) + CH$_3$Cl $\xrightarrow{\text{AlCl}_3}$ + HCl

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Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to University of Mumbai)

APPLIED CHEMISTRY – II

Duration :   (50 MARKS) (KT)

FE (C/M/E) SEM-II
KT-Exam (2014-15)

Master

- **Question No. 1 is compulsory.**
- Attempt any four questions out of remaining.
- Assume any other data needed suitably if not given; but justify the same.
- Illustrate your answers with neat diagram.

Q.1 (a) Describe in detail bimetallic corrosion with suitable example.   05

(b) Explain in detail matrix phase of composite material.   05

Q.2 (a) Describe in detail intergranular corrosion mechanism.   05

(b) Explain in detail metal cladding process.   05

Q.3 (a) A coal sample has the following composition by mass, C = 85%, H = 7%, O = 3%, S = 3.5%, N = 2.1% and ash = 4.4%. Calculate Gross and net calorific value using Dulong's formula.   05

(b) Give any five principles of green chemistry.   05

Q.4 (a) Describe in detail woods metal alloy.   05

(b) 1.5 g of coal sample was taken for %C and %H estimation by combustion method. The increase on weight of tube containing anhydrous $CaCl_2$ and bulb containing KOH was found to be 1.25 g and 4.88 g respectively. Calculate the % C and % H for give coal sample.   05

Q.5 (a) A gaseous fuel has the following composition by volume, H_2 =35%, CH_4 = 45%, C_2H_6 = 6%, CO = 12% and remaining is % N_2. Calculate the minimum amount of air required at 27 ^{0}C and 760 mm Hg pressure for the complete combustion of 1M^3 of fuel.   05

(b) Give any five applications of composite materials.   05

Q.6 (a) Give any five points of differences between galvanization and tinning process.   05

(b) Describe in detail application of powder metallurgy.   05

Q.7 (a) A coal sample contain C = 85%, H = 5%, O = 5%, S = 2% and ash = 3%. Calculate the minimum amount of air by weight and by volume required for complete combustion of 2 Kg of fuel.   05

(b) Calculate the % atom economy for the following reactions.   05
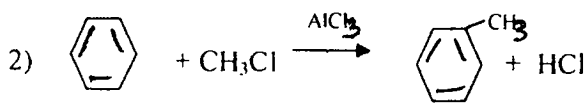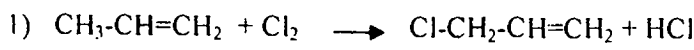
1) $CH_3-CH=CH_2 + Cl_2 \longrightarrow Cl-CH_2-CH=CH_2 + HCl$

2)   + CH_3Cl $\xrightarrow{AlCl_3}$ + HCl

Bharatiya vidya bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

[An autonomous institution Affiliated to university of Mumbai]

K.T. EXAMINATION FOR F.E.(C/M/E) _APR 2015

Total marks : 50

duration : 1hr. 30 min.

Subject : Applied Physics(Sem-1)

master

- Draw diagrams wherever necessary.
- Answer any five out of the rest.
- Figure to right indicate full marks.
- Good luck!

Answer any five:

1. a) Obtain Co-ordination number and atomic packing factor body centered cubic and Hexagonal closed packed structure with explanation?   (6)

b) Magnetic susceptibility of medium is 948*10^{-12}. Calculate the permeability and relative permeability?   (4)

2. a) Define 1) magnetomotive force, 2) reluctance, 3) permeance with proper units and formulae relating them?   (6)

b) Using the following data which type of unit cell GaAs forms
Density of GaAs =5.324 gm/cm^3
Atomic weight of Ga=69.7 & As=74.9
Lattice constant of GaAs=5.65 A^0?   (4)

3. a) Write a short note on atomic origin of magnetization and hence derive the expression for Orbital and spin dipole moment?   (6)

b) What is surface charge density? Derive equation of potential for surface charge density?   (4)

4. a) How are characteristic X- rays produced ? Explain the characteristic- ray spectrum?   (6)

b) Draw a following simple cubic crystal structure: $(0\bar{2}3),(3\bar{3}0)$?   (4)

5. a) State and explain fundamental theorem for divergence and curl?   (6)

   b) Determine glancing angle at which X-ray spectral line of wavelength 0.1787 nm is reflected in the third order when it falls on (111) plane of KCL crystal having density 1990 gm/m³ and molecular weight 74.6?   (4)

6. a) Derive Bragg's law for x rays diffraction? Write a short note rotating crystal method?   (6)

   b) Find the miller indices of a plane which intersects at a, b/2, 3c along X,Y and Z –axis

   respectively in simple cubic unit cell?   (4)

7. a) Let R be the separation vector from (x',y',z') to (x,y,z).find 1)gradient of R^2?

   2)Gradient of 1/R?   (5)

   b) Differentiate soft ferromagnetic materials and hard ferromagnetic materials?   (5)