Total No. of Questions : 12] [Total No. of Printed Pages : 4

[3461]-6 NOV-2008

F. E. (2003 Course) Examination - 2008

ENGINEERING MATHEMATICS - II

Time : 3 Hours] [Max. Marks : 100

Instructions :

(1) *In section I, attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6. In section II, attempt Q. No 7 or Q. No. 8, Q. No. 9 or Q. No. 10, Q. No. 11 or Q. No. 12.*

(2) *Answers to the **two sections** should be written in **separate answer-books**.*

(3) *Figures to the right indicate full marks.*

(4) *Neat diagrams must be drawn wherever necessary.*

(5) *Use of non-programmable electronic pocket calculator is allowed.*

(6) *Assume suitable data, if necessary.*

SECTION - I

Q.1) (A) Form the differential equation for which $y = Ax + \frac{B}{x}$ is the solution. **[04]**

(B) Solve **any three :** **[12]**

(1) $(xy^3 + y)\,dx + 2\,(x^2y^2 + x + y^4)\,dy = 0$

(2) $x\cos x \frac{dy}{dx} + y\,(x\sin x + \cos x) = 1$

(3) $(2x + y - 3)\,dy - (x + 2y - 3)\,dx = 0$

(4) $(1 + xy)y\,dx + (1 - xy)x\,dy = 0$

OR

Q.2) (A) Form the differential equation from $x = (A + Bt)\,e^t$. **[04]**

(B) Solve **any three** : **[12]**

(1) $x \frac{dy}{dx} + 3y = x^4 e^{1/x^2} y^3$

(2) $x\,(x - y)dy + y^2dx = 0$

(3) $y^2\,(x^2 + 2)dx + (x^3 + y^3)\,(ydx - xdy) = 0$

(4) $(y^2 + 2yx^2)\,dx + (2x^3 - xy)\,dy = 0$

Q.3) Solve **any three** :

(a) Find orthogonal trajectories of the family of cardioids $r = a(1 - \cos\theta)$ **[05]**

(b) If temperature of the air is 30°C. and substance cools from 100° C. to 70° C. in 15 minutes. Find when the temperature will be 40° C. **[05]**

(c) A particle of mass m is suspended from one end of the spring whose other end is attached to a fixed point. If the extension in length due to the mass of the particle is e, find the period of oscillation. **[06]**

(d) A pipe 10 cm in diameter contains steam at 100° C. It is covered with asbestos sheet 5 cm thick for which k = 0.0006 and outer surface temperature is 30° C. Find the amount of heat lost per hour through one meter length pipe. **[06]**

OR

Q.4) Solve **any three**

(a) In an electric circuit containing inductance and resistance in series with constant e.m.f. E, if initial current is zero, show that the current builds up to half its theoretical maximum. in $\frac{L \log 2}{R}$ seconds. **[05]**

(b) Water at temperature 100° C. cools in 10 minutes to 88° C. in a room of temperature 25° C. Find the temperature of water after 20 minutes. **[05]**

(c) If 30% of a radioactive substance disappeared in 10 days, how long will it take for 90% of it to disappear ? **[06]**

(d) A particle of mass m is projected upword with velocity V. Assuming the air resistance k times its velocity, show that it will reach maximum height in time $\frac{m}{k} \log\left(1 + \frac{kV}{gm}\right)$ and find the distance travelled at any time t. **[06]**

Q.5) (A) Find the equation of right circular cylinder whose guiding curve in $x^2 + y^2 + z^2 = 9$, $x - y + z = 3$. **[06]**

(B) Find the equation of cone with vertex (1, 2, 3) and guiding curve given by $x^2 - 2y^2 + z^2 = 4$, $x - y + z = 3$. **[05]**

(C) Find the equation of sphere which touches the sphere $x^2 + y^2 + z^2 - x + 3y + 2z - 3 = 0$ at (1, 1, –1) and passes through (0, 0, 3). **[06]**

OR

Q.6) (A) Find the center and radius of the circle $x^2 + y^2 + z^2 - 2x + 4y + 2z - 6 = 0$, $x + 2y + 2z - 4 = 0$. Also find the orthogonal projection of the area of the circle in yz-plane. **[06]**

(B) Find the equation of cylinder with generators parallel to $\frac{x}{1} = \frac{y}{1} = \frac{z}{1}$ and with guiding curve $x^2 + 2y^2 + 6xy - 2z + 8 = 0$, $x - 2y + 3 = 0$. **[05]**

(C) Find the equation of right circular cone whose vertex is at (0, 0, 10) and whose intersection with xy-plane is a circle of diameter 10. **[06]**

SECTION - II

Q.7) (A) Obtain the Fourier Series for the periodic function defined in the interval $-\pi < x < \pi$ as $f(x) = x + \frac{x^2}{4}$.

Hence show that $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \ldots = \frac{\pi^2}{12}$. **[08]**

(B) If $I_n = \int_0^{\pi/2} x^n \sin(2p + 1)\, x\, dx$, prove that

$$(2p + 1)^2 I_n + n(n - 1) I_{n-2} = (-1)^p \cdot n \cdot \left(\frac{\pi}{2}\right)^{n-1}$$ **[05]**

(C) Evaluate $\int_0^1 x^m (\log x)^n \, dx$ **[04]**

OR

Q.8) (A) Determine the first two harmonics of the Fourier Series for the following data :

x	0	1	2	3	4	5
y	9	18	24	28	26	20

[08]

(B) If $I_n = \int_{\pi/4}^{\pi/2} \cot^n \theta \, d\theta$, prove that

$I_n = \frac{1}{n-1} - I_{n-2}$. Hence evaluate $\int_{\pi/4}^{\pi/2} \cot^6 \theta \, d\theta$ **[05]**

(C) Evaluat $\int_4^6 \sin^4 \pi x \cos^2 2\pi x \, dx$ **[04]**

Q.9) (A) Trace the following curves : **(Any Two)** **[08]**

(1) $y^2 (x - a) = x^2 (2a - x)$

(2) $r = a (1 + \sin\theta)$

(3) $x = a\cos^3 t$, $y = a\sin^3 t$

(B) Find the length of the upper arc of one loop of the curve $r^2 = a^2 \cos 2\theta$. **[05]**

(C) Find $\frac{d}{dx} (\text{erf}(ax^n))$. **[04]**

OR

Q.10) (A) Trace the following curves : **(Any Two)** **[08]**

(1) $x^3 + y^3 = 3axy$

(2) $r = a \cos 3\theta$

(3) $y^2 = (x - 1) (x - 2) (x - 3)$

(B) Evaluate $\int_0^\infty \frac{1}{x^2} \log(1 + ax^2) \, dx$ **[05]**

(C) Prove that $\text{erf}_c(x) + \text{erf}_c(-x) = 2$ **[04]**

Q.11) (A) Express the following integral as a single term double integral and evaluate :

$$\int_0^1 \int_0^y \left(x^2 + y^2\right) dxdy + \int_1^2 \int_0^{2-y} \left(x^2 + y^2\right) dxdy$$ **[06]**

(B) Find the area inside the circle $r = a\sin\theta$ and outside the cardioide $r = a(1 - \cos\theta)$. **[05]**

(C) Find the centre of gravity of an arc of a uniform sector of a circle of radius 'a', angle at the centre being 2α. **[05]**

OR

Q.12) (A) Find the volume enclosed between the cylinders $x^2 + y^2 = 2ax$ and $z^2 = 2ax$. **[06]**

(B) A rod of length 'a' is divided into three parts. Find the mean value of the product of these parts. **[05]**

(C) Find the moment of inertia of the portion of the parabola $y^2 = 4ax$, bounded by x–axis and latus rectum, about x–axis, if density at each point varies as the cube of the abscissa. **[05]**

Total No. of Questions : 12] [Total No. of Printed Pages : 4

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F. E. (2003 Course) Examination - 2008

APPLIED SCIENCE - II

Time : 3 Hours] [Max. Marks : 100

Instructions :

*(1) Answer **three** questions from section - I and **three** questions from section - II.*

*(2) Answers to the **two sections** should be written in **separate books**.*

(3) Black figures to the right indicate full marks.

(4) Neat diagrams must be drawn wherever necessary.

(5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(6) Assume suitable data, if necessary.

Constants : $e = 1.6 \times 10^{-19}$ C

$h = 6.63 \times 10^{-34}$ J.s

$m_e = 9.1 \times 10^{-31}$ kg

$C = 3 \times 10^{8}$ m/s

SECTION - I

Q.1) (A) State Heisenberg's uncertainty principle. Illustrate the same with electron diffraction experiment at a single slit. **[07]**

(B) Derive an expression for the energy eigen values of a harmonic oscillator and compare the results with classical mechanics. **[07]**

(C) Calculate De-Broglie Wavelength of 10 keV electron. **[03]**

OR

Q.2) (A) Explain in short De-Broglie's hypothesis of matter waves. Explain Davisson and Germer's experiment qualitatively as proof for De-Broglie's hypothesis of matter waves. **[07]**

(B) Deduce Schrodinger's Time independent wave equation. **[06]**

(C) Calculate first two energy eigen values of an electron in eV which is confined to a box of length 2 A.U. **[04]**

Q.3) (A) State four important characteristics of LASER. Explain construction and working of Ruby LASER. **[07]**

(B) What are Ferrites ? How they are produced ? Explain any one method of production of ferrites and state any four applications of ferrites. **[06]**

(C) Explain the Phenomenon of Superconductivity. State any two applications of Superconductivity. **[04]**

OR

Q.4) (A) Explain : (1) Stimulated emission

(2) Optical pumping

(3) Population inversion

(4) Metastable state **[08]**

(B) State and explain : (1) Meissner effect

(2) Isotope effect **[06]**

(C) State any six application of LASER. **[03]**

Q.5) (A) Explain classification of solids into conductors, semiconductors and insulators on the basis of Energy Band Theory. **[06]**

(B) Explain construction and working of Bainbridge Mass Spectrograph. **[06]**

(C) Draw energy band diagram of P-N junction diode under Forward Bias and Reserve Bias Condition. **[04]**

OR

Q.6) (A) Explain construction and working of Electron Microscope in analogy with Optical Microscope. [06]

(B) Derive an expression for Condutivity of Semiconductors. [06]

(C) (1) State merits and demerits of Solar Cell.

(2) State any two applications of Solar Cell. [04]

SECTION - II

Q.7) (A) What is the principle of all Calorimeters. Explain working of Bomb Calorimeter with diagram. [07]

(B) Explain Proximate Analysis of Coal with its significance. [06]

(C) A sample of coal containing 5% H_2 when allowed to undergo combustion in Bomb Calorimeter, the following data were obtained.

wt. of coal burnt = 0.95 gm

wt. of water taken = 700 gm

water equivalent of bomb calorimeter = 2000 gm

rise in temperature = 2.48^{o} C

cooling correction = 0.02^{o} C

fuse wire correction = 10 cal

acid correction = 60 cal

Calculate Gross and Net Colorific Value of Coal. [04]

OR

Q.8) (A) Describe the process of distillation of crude petroleum with diagram. Give composition, boiling range and uses of any three fractions obtained. [07]

(B) Explain :

(1) Octane Number of Petrol

(2) Cetane Number of Diesel [06]

(C) A gas has following composition by volume :

H_2 = 20% CH_4 = 6% CO = 22%

CO_2 = 4% O_2 = 4% N_2 = 44%

Find the volume of air actually supplied per m^3 of this gas. **[04]**

Q.9) (A) Describe different factors affecting Corrosion. **[07]**

(B) Write short note on Fuel Cell. **[06]**

(C) Differentiate between Anodic Coatings and Cathodic Coatings. **[04]**

OR

Q.10) (A) Explain construction, working, reaction and application of Nickel – Cadmium Battery. **[07]**

(B) Explain hydrogen evolution and oxygen absorption mechanism of electrochemical corrosion. **[06]**

(C) Explain Nernst theory regarding electrode potential. **[04]**

Q.11) (A) Describe the method to identify the two metal ions from the mixture using paper chromatograph. **[06]**

(B) Describe the Laws of Absorption. **[06]**

(C) Write the applications of Ultra-Visible Spectroscopy. **[04]**

OR

Q.12) (A) Describe working of column chromatography. **[06]**

(B) Define the following shifts with proper diagram and examples :

(1) Bathochromic Shift

(2) Hypsochromic Shift

(3) Hyperchromic Shift

(4) Hypochromic Shift **[06]**

(C) Give important characteristics of electromagnetic radiations. **[04]**

Total No. of Questions : 12] [Total No. of Printed Pages : 7

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F. E. (2003 Course) Examination - 2008

ENGINEERING MECHANICS

Time : 3 Hours] **[Max. Marks : 100**

Instructions :

(1) Answer Q.1 or Q.2, Q.3 or Q.4 and Q.5 or Q.6 from section I and Q.7 or Q.8, Q.9 or Q.10 and Q.11 or Q.12 from section II.

*(2) Answers to the **two sections** should be written in **separate answer-books**.*

(3) Figures to the rights indicate full marks.

(4) Neat diagrams must be drawn wherever necessary.

(5) Use of electronic pocket calculator is allowed.

(6) Assume suitable data, if necessary and clearly state them.

(7) Use of cell phone is prohibited in the examination hall.

SECTION - I

Q.1) (A) A right circular cone of height 120 mm and radius of base is 30 mm has its centre of gravity on its geometric axis at 30 mm above the base. A horizontal force P is applied to the vertex O of the cone as shown in Fig. 1 (A). If $\mu = 0.5$ find the values of P to prevent sliding and overturning. Weight on cone is 10 N. **[10]**

(B) Find the reactions at fixed support A and hinged support C for the compound beam ABC with internal hinge at B as shown in Fig. 1 (B). **[08]**

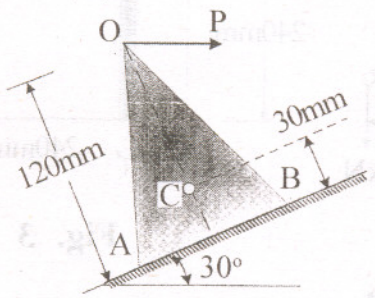

Fig. 1(A)

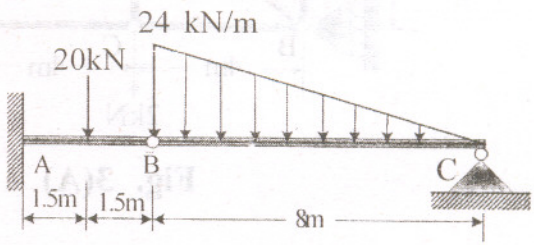

Fig. 1(B)

OR

Q.2) (A) Find the resultant of the concurrent force system as shown in Fig. 2 (A) in magnitude and direction. **[08]**

(B) Find the centroid of the shaded area with respect to origin O as shown in the Fig. 2(B) **[08]**

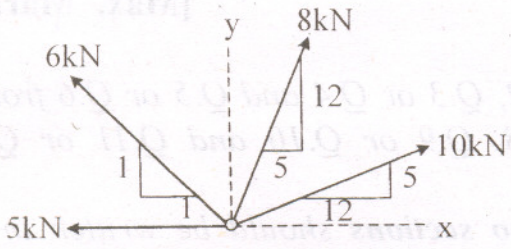

Fig. 2(A)

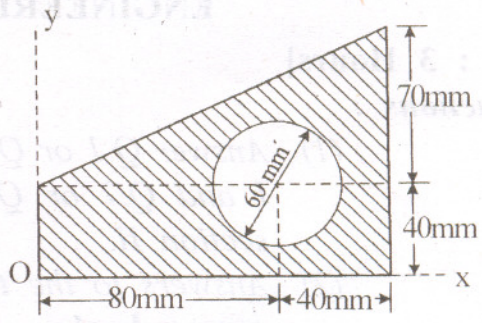

Fig. 2 (B)

Q.3) (A) Determine the forces in all members of a plane truss as shown in Fig. 3(A) and tabulate your results with magnitude and nature of forces. **[08]**

(B) A force of magnitude 280 N is applied to member ABCD, which is supported by a frictionless pin at A and by the cable CED. The cable passes over a small and smooth pulley at E. If a = 60 mm, determine the tension in the cable and the reaction at A. Refer Fig. 3(B). **[08]**

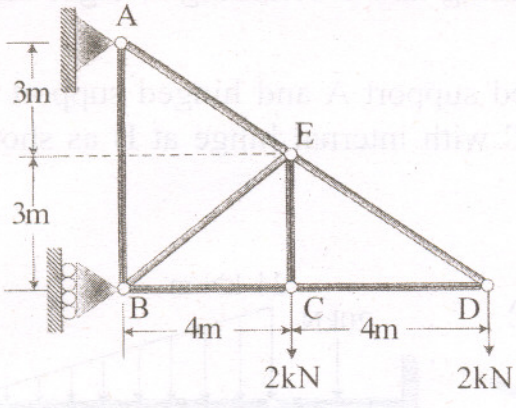

Fig. 3(A)

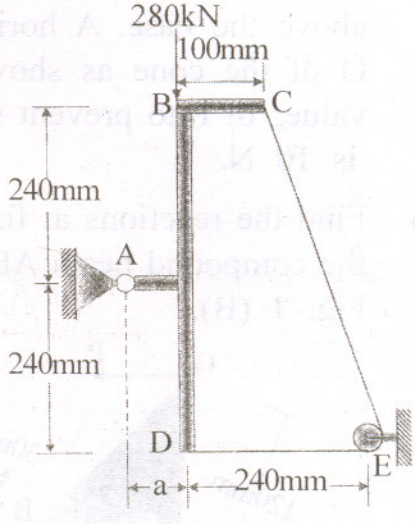

Fig. 3 (B)

OR

Q.4) (A) Determine the magnitude and direction of the resultant with respect to point A for the general force system as shown in Fig.4(A) **[08]**

(B) Cable ABCD supports two point loads at B and C as shown in Fig. 4(B). The sag at point B is 2 m. Determine the reactions at pinned supports and tension in three segments. **[08]**

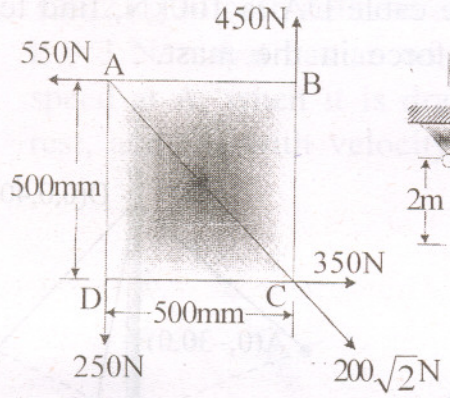

Fig. 4(A)

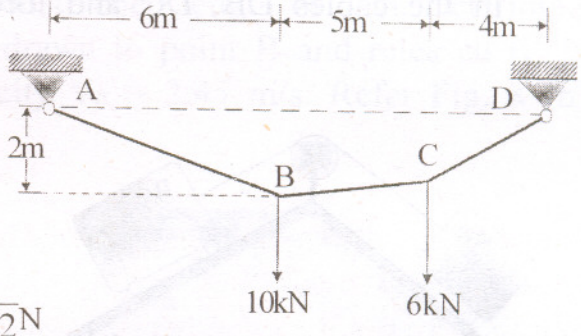

Fig. 4(B)

Q.5) (A) Using virtual work method, find the reaction at support A and B for a beam CD loaded and supported as shown in Fig 5(A). **[08]**

(B) Three forces 20 kN, 30 kN and 40 kN act normal to x-y plane as shown in Fig. 5(B). Find the magnitude, direction and point of application of resultant force. **[08]**

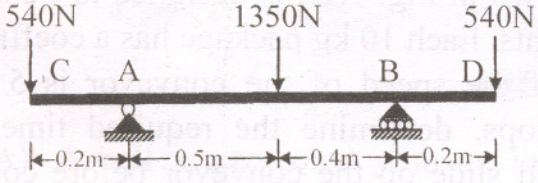

Fig. 5(A)

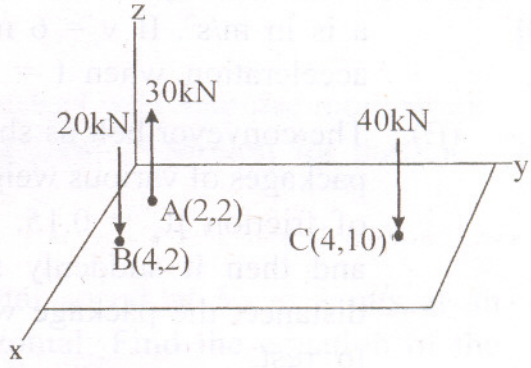

Fig. 5(B)

OR

Q.6) (A) State and explain the principle of virtual work and hence, find the angle θ to maintain the equilibrium for the mechanism as shown in Fig. 6(A). Take W_1 = 100N and W_2 = 150N. **[08]**

(B) A vertical mast OD is having base O with ball and socket. Three cables DA, DB and DC keep the mast in equilibrium as shown in Fig. 6(B). If tension in the cable DA is 100kN, find tensions in the cables DB, DC and force in the mast. **[08]**

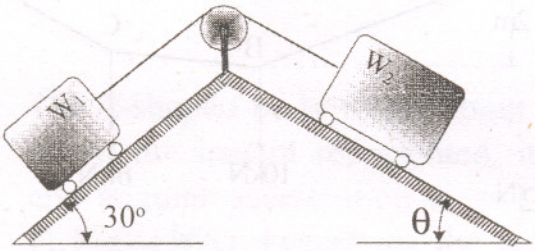

Fig. 6(A)

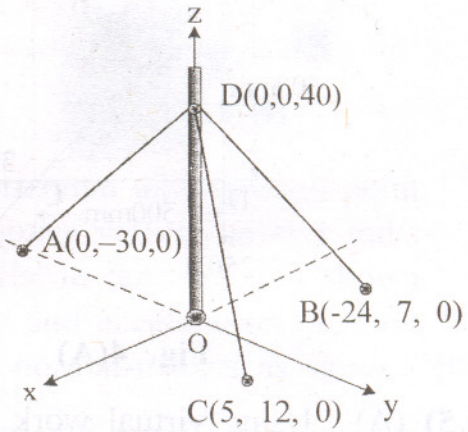

Fig. 6(B)

SECTION - II

Q.7) (A) A particle travels in a straight line such that for a short time t = 2 s to 6 s, its motion is described by v = 4/a m/s, where a is in m/s^2. If v = 6 m/s when t = 2 s, determine the particle acceleration when t = 3s. **[08]**

(B) The conveyor belt as shown in Fig. 7(B) is designed to transport packages of various weights. Each 10 kg package has a coefficient of friction μ_k = 0.15. If the speed of the conveyor is 5 m/s, and then it suddenly stops, determine the required time and distance, the package will slide on the conveyor before coming to rest. **[08]**

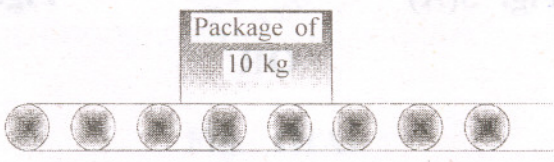

Fig. 7(B)

OR

Q.8) (A) Two planes A and B, are flying at the same altitude. If their velocities are V_A = 600 kmph and V_B = 500 kmph and the angle between their straight courses is $\theta = 75^\circ$, determine the velocity of plane B with respect to plane A and the shortest distance between them is 5 minutes. Refer Fig. 8(A). **[08]**

(B) The 2 kg smooth collar is attached to a spring of spring constant, k = 3 N/m that has an unstreched length of 3 m. Determine its speed at A, when it is drawn to point B and released (i) from rest, and (ii) with velocity V_B = 2.45 m/s. Refer Fig. 8 (b). **[08]**

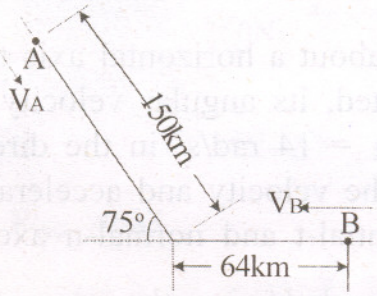

Fig. 8(A)

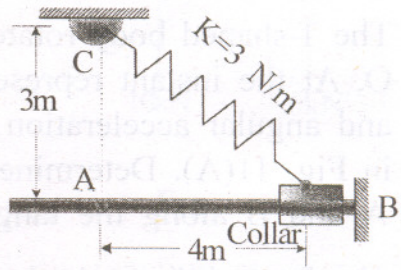

Fig. 8(B)

Q.9) (A) A particle moves in the x-y plane such that its position is defined by vector $r = (2t\ i + 4t^2\ j)m$, where t is in seconds. Determine the radial and tangential components of the particle's velocity and acceleration when t = 0.25S. **[08]**

(B) Derive an expression of work-energy and impulse-momentum principle from Newton's Second Law of Motion for particle. **[08]**

OR

Q.10) (A) A ball is projected with an intital speed of V_A = 8 m/s at an angle of $\theta = 40^\circ$ with the horizontal. Find the equation of the path (trajectory), y = f(x) and determine ball's velocity, normal and tangential component of acceleration when t = 0.25S. Refer Fig. 10(A). **[08]**

(B) A 60 kg ball B is attached to a 15m long steel cable AB and swing in a vertical arc as shown in Fig. 10(B). Determine the tension in the cable (a) at the top C of the swing, and (b) at the bottom D of the swing where the speed of the ball is 4.2m/s. **[08]**

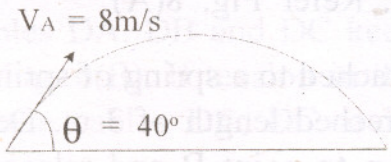

Fig. 10(A)

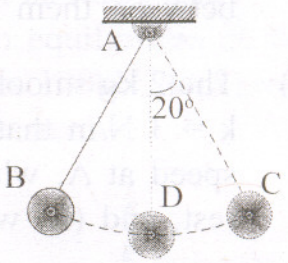

Fig. 10(B)

Q.11)(A) The T-shaped body rotate about a horizontal axis through point O. At the instant represented, its angular velocity $\omega = 3$ rad/s and angular acceleration $\alpha = 14$ rad/s^2 in the direction shown in Fig. 11(A). Determine the velocity and acceleration of point A and B along the tangential-t and normal-n axes as shown. **[08]**

(B) A sphere and a cylinder, each having the same mass and the same radius, are released from rest on an incline. Determine the velocity of each body in terms of g and h, after it has rolled through a distance corresponding to a change in elevation h. **[08]**

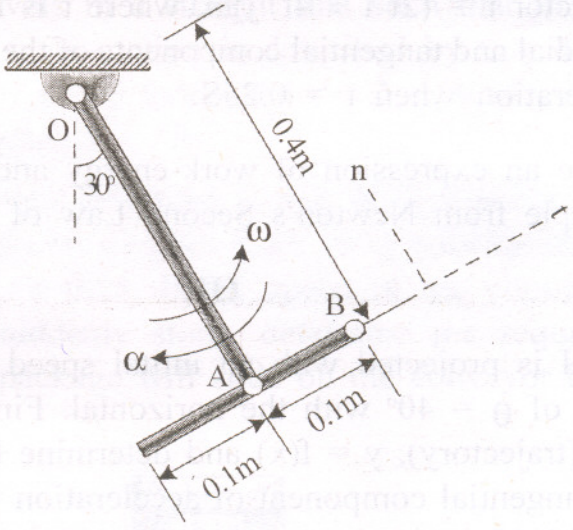

Fig. 11(A)

OR

Q.12)(A) The uniform slender bar AB has a mass of 8 kg and swings in a vertical plane about the pivot at A. If $\omega = 2$ rad/s when $\theta = 30^{\circ}$, determine the pin reaction at A. Refer Fig. 12(A). **[08]**

(B) The constrained link as shown in Fig. 12(B), end A of link has a downward velocity $V_A = 2$ m/s during an interval of its motion. For the position where $\theta = 30^{\circ}$, determine the angular velocity ω of link AB and the velocity V_G of the midpoint G of the link. **[08]**

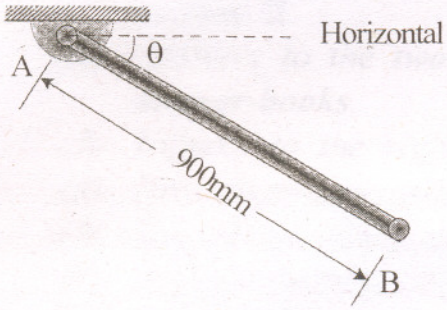

Fig. 12(A)

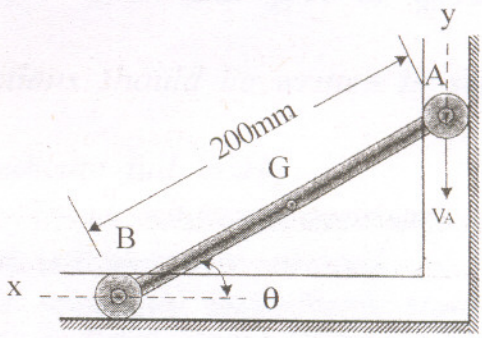

Fig. 12(B)

(C) A voltage V = 300 cos100t is applied to half wave rectifier with R_L = 5kΩ. The rectifier may be represented by idle diode in series with a resistance of 1kΩ.

Calculate :

(1) Im

(2) D.C. Power

(3) A.C. Power

(4) Conversion Efficiency

(5) Ripple Factor **[06]**

Q.3) (A) List and explain performance parameters of a power supply. **[08]**

(B) Draw a neat circuit diagram of zener regulator circuit and calculate the component values to meed following specifications :

Load Voltage = 8V ; Sourse Voltage = 30V, I_L = 50 mA. Assume Izmin = 5mA ; Pz = 1 watt. **[08]**

OR

Q.4) (A) For an amplifier the midband gain is 50 and lower half power frequency is 80 Hz. Find out the gain of amplifier at the lower half power frequency. **[04]**

(B) What do you understand by D.C. load line and D.C. bias point. Explain their significance. **[06]**

(C) Explain why C.B. and C.C. configurations are not suitable to operate transistor as a switch. **[06]**

Q.5) (A) Simplify following boolean expressions :

(1) $XY + X\overline{Z} + X\overline{Y}Z\ (XY + Z)$

(2) $\overline{A} + \overline{B} + ABC + A\overline{B}$

Realise the simplified expressions using standard gates. **[08]**

(B) Implement the following boolean equation with OR-AND logic and NOR-NOR logic.

$Y = AC + BC + AB + D$ **[06]**

(C) Explain NOR and Ex-NOR logic gates with the help of boolean expression and truth table. **[04]**

OR

Q.6) (A) Define Positive Logic and Negative Logic. **[04]**

(B) Design 1–bit comparator circuit using K-map. **[08]**

(C) Prove the following boolean identifies : **[06]**

(1) $AB + ABC + A\overline{B} = A$

(2) $A\overline{B} + \overline{A}B + AB + \overline{A}\overline{B} = 1$

SECTION - II

Q.7) (A) Draw neat circuit diagram of Wine Bridge Oscillator using Op-Amp and explain its operation give equation of frequency of oscillations. **[06]**

(B) Define and give typical values of following Op-Amp parameters : **[06]**

(1) CMRR

(2) Input Impedance

(3) Stew Rate

(C) In R-C phase shift oscillator if $R_1 = R_2 = R_3 = 2.2k\Omega$ and $C_1 = C_2 = C_3 = 0.1\mu F$. Calculate Frequency of Oscillations. **[04]**

OR

Q.8) (A) An Op-Amp is used in following modes with $R_1 = 1k\Omega$, $R_f = 100\ k\Omega$, $V_i = 10mV$ and $V_{cc} = \pm 12V$. Find V_o in each case.

(1) Inverting Mode

(2) Non-inverting Mode

Draw output waveforms if input is sinusoidal. **[08]**

(B) Draw a neat circuit diagram of non-inverting summing amplifier with two input and derive expression for output voltage. **[08]**

Q.9) (A) Write short note on classifications and selection criteria for transducers. **[08]**

(B) With the help of neat diagram explain construction and working of LVDT. **[08]**

OR

Q.10) Write short notes on : **[16]**

(1) P. A. System

(2) RTD

(3) Piezo-electric Transducer

(4) Weighing Machine

Q.11)(A) Explain following Front Panel Control of CRO : **[10]**

(1) Trigger

(2) X-Y Mode

(3) Volt / div.

(4) Time / div.

(5) Component Testing

(B) Calculate the component values of a square wave generator using IC555 to meet the following F_o = 10 kHz and duty cycle = 40%. Draw necessary circuit diagram. (Assume C = 0.1 μF) **[08]**

OR

Q.12)(A) Explain the application of monostable multivibrator as : **[10]**

(1) Frequency Divider

(2) Pulse Width Modulator

(B) Explain with block diagram : **[08]**

(1) Electronic Counter

(2) Buglar Alarm

Total No. of Questions : 12] [Total No. of Printed Pages : 3

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F. E. (2003 Course) Examination - 2008

ENGINEERING GRAPHICS - II

Time : 4 Hours] [Max. Marks : 100

Instructions :

(1) Attempt Q. 1 or Q. 2, Q. 3 or Q. 4 and Q. 5 or Q. 6 from section I and attempt Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12 from section II.

*(2) Answers to **two sections** should be written in separate **answer books**.*

(3) Assume suitable data if necessary.

(4) Figures to right indicate full marks.

SECTION - I

Q.1) Plan of a straight line AB measures 80 mm. The line is inclined at 35° to VP and 45° to HP, while the end B is 80 mm infront of VP. Draw projections of line when its VT is 15 mm above HP. Find the length to line and locate its HT.

Also find the distance between XY line and AB line and distance between XY line and mid point of line AB. **[16]**

OR

Q.2) The ends A, B and C of three rods are resting on ground. The other ends meet at point 'O', 1.2m above ground. The top view of the assembly consists of three lines of length 1m, 0.8 m and 0.6m.

The 1m line makes 30° with horizontal in anticlockwise direction. Angle between 1m and 0.6m lines is 100° measured anticlockwise from OA. The 0.8m line is placed at 140° from 1 m line measured clockwise from OA. Draw projections of the assembly and find the true length and true inclination of each rod with ground. **[16]**

Q.3) Draw projection of a circular lamina of 80mm diameter having the end A of its diameter AB in HP and end B in VP and the surface is inclined at 30° to HP and 60° to VP. [16]

OR

Q.4) A triangle PQR has PQ = 80 mm, QR = 60 mm and PR = 120 mm. The side PQ is in VP and makes 30° to HP. Point P is 20 mm above HP and point R is 40 mm infront of VP. Draw projection of the triangle. Also find the angle the triangle make with HP and VP. [16]

Q.5) Draw the plan and elevation of a cube of sides 60 mm when the solid diagonal is perpendicular to VP and the corner of the cube is in HP. [18]

OR

Q.6) A square prism of side of base 45mm and length of axis 75mm is resting on HP on a longer side with the faces equally inclined to HP. The side which is on HP is perpendicular to VP. A triangular pyramid of base side 35mm and length of axis 80mm is resting on HP on an edge of base such that the triangular face through that edge mates centrally with the face of the prism. Draw two views of the combination. Also project another view an AVP, inclined to VP at 50°. [18]

SECTION - II

Q.7) A triangular prism of 60mm side of end face and 90mm long rest with a longer edge in HP and parallel to VP. The rectangular faces with that edge are equally inclined to HP. It's cut by an AVP inclined to VP such that true shape of section is an isosceles triangle of 90mm base. Draw AVP, sectional elevation and true shape of section. [16]

OR

Q.8) A cone of base diameter and height 60 mm is resting on its base on HP. It is cut by two auxiliary inclined planes mutually perpendicular and intersecting each other on the axis of the cone. One of the cutting planes passes through the extreme left point on base circle and the other passes through extreme right of the base circle. Draw three views and show the sections in two views. [16]

Q.9) A frustum of a cone of base diameter and height 60 mm has height of its axis 40mm long. An equilateral triangular hole of size 20mm is cut at the mid point of the axis of the frustum. One of the triangular faces of the hole is parallel to HP. Show the development of lateral surface. Also show the curves in top view. **[16]**

OR

Q.10) A sheet metal development of a cylinder is shown in figure 1. If AB is nearest to be observer, show the curves in all the three views of the cylinder. **[16]**

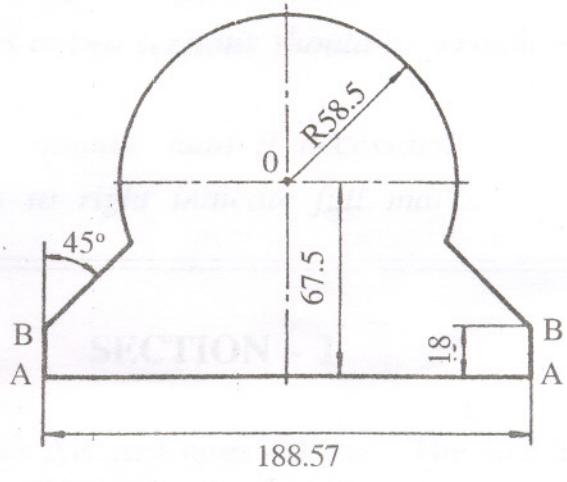

Fig. 1

Q.11) A vertical square prism, edge of base 45 mm and height 85mm rests on its base on HP with a vertical face inclined at 60° to VP, is penetrated by horizontal square prism edge of base 35mm and axis 90mm long having one of its rectangular faces inclined at 30° to VP. The axes of prism bisect each other. Draw the three views showing the curves of interpenetration. **[18]**

OR

Q.12) A sphere of 90 mm diameter is penetrated by an isoscles triangular prism, 64 mm side of the triangle, 74 mm altitude and 110 mm length, having its vertical rectangular face of minimum width parallel to VP and 25 mm behind the centre of a sphere. The two axes are contained in a vertical plane perpendicular to VP. Draw the three views and show the curves of intersection. **[18]**
