



AIKTC/KRRC/SoET/ACKN/QUES/2019-20/

Date: 15/01/2020School: SoET-CBSGSBranch: ALL BRANCHESSEM: II

To,
Exam Controller,
AIKTC, New Panvel.

Dear Sir/Madam,

Received with thanks the following Semester/Unit Test-I/Unit Test-II (Reg./ATKT) question papers from your exam cell:

Sr. No.	Subject Name	Subject Code	Format		No. of Copies
			SC	HC	
1	Applied Mathematics- II	FEC201		✓	02
2	Applied Physics- II	FEC202		✓	02
3	Applied Chemistry- II	FEC203		-	-
4	Engineering Drawing	FEC204		✓	02
5	Structured Programming Approach	FEC205		-	-
6	Comm. Skills- II	FEC206		-	-

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
Librarian, AIKTC

2

FE-SEM - I - CBSGS

5/12/19

Duration – 3 Hours

Total Marks: 80

- N.B.** 1. Question No. 1 is compulsory.
 2. Attempt any **THREE** questions out of remaining **FIVE** questions.
 3. Figures to right indicate full marks.

1) a) Solve $2(x^2\sqrt{y} + 1)y dx + (x^2\sqrt{y} + 2)x dy = 0$ (4)

b) Find the particular integral of $(D-3)y = x$ (3)

c) Evaluate $\int_0^{\infty} e^{-x^2} dx$ (3)

d) Sketch the region of integration $I = \int_1^4 \int_0^{\sqrt{x}} \frac{3}{2} e^{(y/\sqrt{x})} dy dx$ (3)

e) Prove that $E = 1 + \Delta = e^{h^2}$ (3)

f) Using Euler's method find the approximate value of y, where $\frac{dy}{dx} = \frac{y-x}{\sqrt{xy}}$ (4)

and $y(1) = 2$ when $x = 1.5$ in five steps taking $h=0.1$

2 a) Solve $\frac{dy}{dx} + y = y^2(\cos x - \sin x)$ (6)

b) Show that $\int_0^{\pi} \frac{\tan^{-1} ax}{x(1+x^2)} dx = \frac{\pi}{2} \log(1+a)$. Hence evaluate $\int_0^{\pi} \frac{\tan^{-1} x}{x(1+x^2)} dx$ (6)

c) Change to polar and evaluate $I = \int_0^a \int_y^{\sqrt{a^2-y^2}} \frac{dx dy}{(4a^2 + x^2 + y^2)^2}$ (8)

3 a) Given that $\int_0^{\infty} \frac{x^{p-1}}{1+x} dx = \frac{\pi}{\sin p\pi}$. P.T $\Gamma(p)\Gamma(1-p) = \frac{\pi}{\sin p\pi}$ ($0 < p < 1$) (6)

b) Evaluate $\iiint_V \frac{dx dy dz}{(1+x^2+y^2+z^2)^2}$ where V is the volume in the first octant. (6)

c) Solve by method of variation of parameters $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = \frac{e^{3x}}{x^2}$ (8)

- 4 a) Evaluate $I = \int_0^{\pi} 2 d\theta \int_0^{a(1+\cos\theta)} r dr \int_0^h \left[1 - \frac{r}{a(1+\cos\theta)} \right] dz$ (6)
- b) Solve $(D^3 + 2D^2 + D)y = e^{3x} x^2 + \sin^2 x$ (6)
- c) Using fourth order Runge-Kutta method, solve numerically $\frac{dy}{dx} = x^2 + y^2$ with the conditions $x = 1, y = 1.5$ in the interval $(1, 1.2)$ with $h = 0.1$ correct to 4 decimals. (8)
- 5 a) The density at any point of a cardioid $r = a(1 + \cos\theta)$ varies as the square of its distance from its axis of symmetry. Find its mass. (6)
- b) An equation in the theory of stability of an aeroplane is $\frac{dv}{dt} = g \cos\alpha - kv$ v being velocity and g, k being constants. It is observed that at time $t = 0$, the velocity $v = 0$. Solve the equation. (6)
- c) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using (i) Trapezoidal Rule, (ii) Simpson's $(1/3)^{rd}$ Rule and (iii) Simpson's $(3/8)^{th}$ Rule. Also find the error. (8)
- 6 a) Solve $(2x+1) \frac{d^2y}{dx^2} - 2(2x+1) \frac{dy}{dx} - 12y = 6x$ (6)
- b) For the curve $x = a(2\cos t - \cos 2t), y = a(2\sin t - \sin 2t)$, find the length of the arc of the curve measured from $t = 0$ to any point (6)
- c) Find the volume cut off from the paraboloid $x^2 + \frac{1}{4}y^2 + z = 1$ by the plane $z = 0$ (8)

2

Paper / Subject Code: 29602 / Applied Physics - II.

Time: 2Hours

Marks: 60

- N. B. 1) Question no 1 is compulsory
 2) Attempt any three questions from remaining three questions.
 3) Assume suitable data wherever required
 4) Figures on the right indicates marks
- 1 Attempt any five 15
- a In Newton's ring experiment the diameter of 5th dark ring is 0.5cm, calculate the diameter of 20th dark ring.
- b What is meant by absent spectra? Write the condition of absent spectra.
- c A fiber cable has an acceptance angle of 30° and a core refractive index is 1.4. Calculate the refractive index of cladding.
- d What is resonance cavity? Explain its importance in Lasers.
- e What is the wave function of matter wave? Explain its physical significance
- f How do you measure phase difference between two A.C. signals by CRO?
- g Define superconductivity and explain the statement, "Diamagnetism is the test of superconductivity".
- 2 a For Newton's ring, prove that diameter of nth dark ring is directly proportional to the square root of natural number. 5
 If the diameter of nth and (n+10)th Newton's dark ring are 4mm and 8mm respectively. Determine the wavelength of light used if the radius of curvature is 2 m. 3
- b Differentiate between Step Index and graded Index optical fiber and derive an expression for numerical aperture of step index optical fiber. 7
- 3 a How is laser different than that of ordinary source of light? With neat diagram explain the construction and working of Nd-YAG Laser. 8
- b Why are the fringes straight in the interference pattern of wedge shaped film? Derive an expression for fringe width. 7
- 4 a What is grating element? A monochromatic light of wavelength 5×10^{-5} cm falls normally on a grating of 2cm wide. The first order maxima is produced at 18° from the normal. What are the total number of lines on the grating? 5
- b What is Heisenberg's uncertainty principle? Prove it using single slit electron diffraction. 5
- c What are critical temperature and critical magnetic field of superconducting material? The transition temperature for Pb is 7.2 k. At 5 k it losses the superconducting property if subjected to magnetic field of 4×10^4 A/m. Find the critical magnetic field at 0k. 5
- 5 a For plane transmission grating, prove that the condition of diffraction maximum is $d \sin \theta = n\lambda$, $n=0, 1, 2, 3, \dots$ 5
- b Derive one dimensional time independent Schrodinger wave equation. 5
- c With neat diagram, explain the construction and working of electron microscope. 5
- 6 a An electron has momentum of 5×10^{-14} kg-m/s with an accuracy of 0.05%. Find the minimum uncertainty in the location of electron. 5
- b With neat diagram explain the construction and working of Cathode Ray Tube. 5
- c What are Nano materials? Explain one of the method of its production in detail. 5
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(REVISED COURSE)

[3 Hours]

[Total Marks: 60]

N.B.

1. Question No. 1 is compulsory.
2. Answer any Three questions out of remaining Five questions.
3. Use only Drawing Sheets for answering.
4. Use your judgement for any unspecified diminution.
5. Use First Angle Method of projection only.
6. Retain all construction Lines.

- Q.1 a. A circle of 60mm diameter rolls along a straight line without slipping, draw the curve traced by a point 'P' on the circumference of the circle for one complete revolution. (6)
- b. The pictorial view of a machine part is given in Fig.1b Draw (4)
 (i) Front View in the direction of 'X' (4)
 (ii) Top View. (4)
 (iii) Insert at least 10 major dimensions. (1)

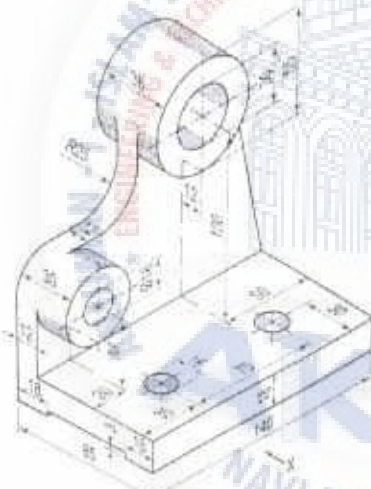


Fig.1b

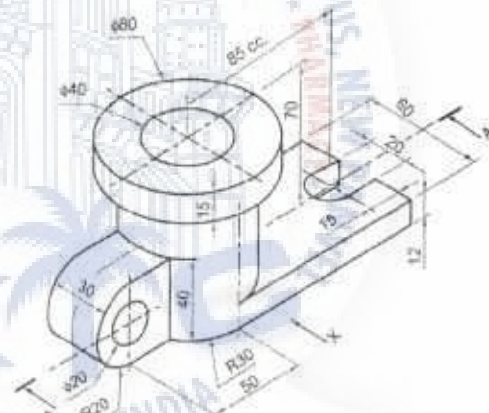


Fig.2

- Q.2 Fig.2 shows a pictorial view of a machine part, Draw: (5)
 (a) Sectional Front View looking along 'X' (Section A-A) (4)
 (b) Top View (4)
 (c) LHSV (4)
 (d) Insert at least 10 major dimensions. (2)
- Q.3 A hexagonal pyramid of 30mm edge of base and 70mm length of axis has base edge on the HP. The axis is inclined at 30° to HP, and 45° to VP. Draw the projections. (15)
- Q.4 a. A cylinder of base diameter 50mm and height 60mm is resting on a point on base circle on H.P. with axis inclined at 30° to H.P. Draw its projections. (6)

TURN OVER

- b. Draw an isometric view of the Fig.4b object using natural scale. (9)

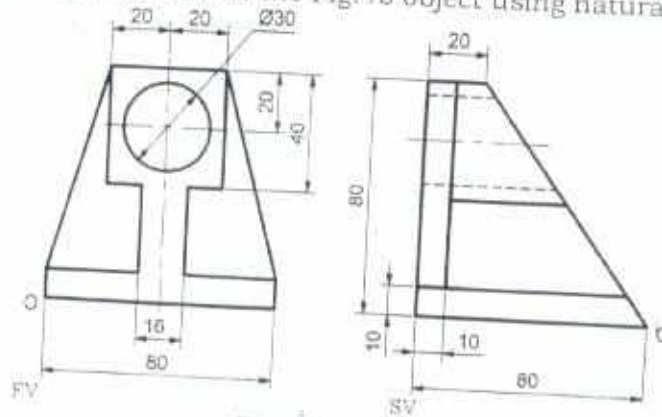


Fig.4b

- Q.5 A cone base 50mm diameter and axis 65mm long is resting on its base on the H.P. A section plane perpendicular to V.P and inclined at 45° to H.P cuts the cone, bisecting its axis. Draw front view, sectional top view, sectional side view and the true shape of the section and also draw its development of lateral surface. (15)

- Q.6 a. A line AB 70mm long is inclined at an angle of 30° to HP and 45° to VP. Its end point 'A' is 20mm above HP and 25mm in front of VP. Draw the projections when point 'B' is in the first quadrant. (9)

- b. Draw an Isometric view of the following object using natural scale. (6)

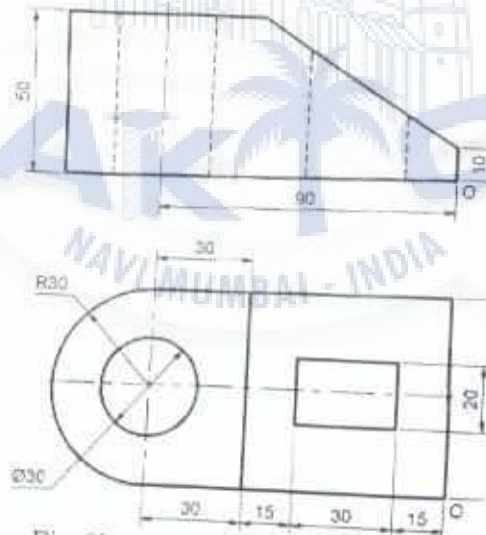


Fig.6b