SUBJECT CODE NO:- P-15
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E.(ALL-BRANCHES) Examination May/June 2017
Engineering Mathematics - III
(Revised)

[Time: Three Hours]   [Max.Marks:80]

Please check whether you have got the right question paper.

N.B
i) Q. No. 1 and Q. No.6 are compulsory
ii) Solve any two questions from Q. Nos. 2, 3, 4 and 5.
iii) Solve any two questions from Q. Nos. 7, 8, 9 and 10.
iv) Use of non-programmable calculator is allowed.
v) Figures to the right indicate full marks.

Section A

Q.1   Solve any five from the following   10
a) Solve $(D^2 - 4D - 12)y = 0$
b) Solve $(D^2+2\pi D+\pi^2)y=0$
c) Find the P.I. of the equation
$(D^2 + D - 6)y = e^{2x}$
d) Find the P.I. of the equation
$(D^3 + 4D)y = sin2x$
e) Find the mean of the following data

Class	5-10	10-15	15-20	20-25	25-30	30-35	35-40
f:	6	5	15	10	5	4	3

f) Find the area under the normal curve between Z= -1.24 to 1.24
g) For a binomial distribution the mean is 12 and the variance is 4, find all the constants of the distribution.
h) A 2 lb weight – suspended from a spring stretches it 1.5 inches. If the weight is pulled 3 inches below the equilibrium position and released set up a differential equation of motion.

Q.2   a) Solve $(D^2 +2)y=e^x cos2x$ 05
b) Calculate the mean deviation from the median for the following data   05

Class	50-100	100-150	150-200	200-250	250-300	300-350
f:	7	18	25	31	15	4

c) An emf of 200V is in series with a 10 ohm resistor, a 1 henry inductor and 0.02 Farad capacitor At t=0,   05
the charge Q and current I are zero. Find Q and I at any time t.

Q.3   a) Calculate the mean and standard deviation for the data   05

Class	68-74	75-81	82-88	89-95	96-102	103-109
f:	5	31	40	20	3	1

b) Solve without using method of variation of parameters $(D^2 + 9)$ y = Sec 3x   05
c) The differential equation of a cantilever beam of length l and weighing w kgs/unit, subjected to a   05
horizontal compressive force P applied at the free end is given by

$EI \frac{d^2y}{dx^2}+Py = \frac{-1}{2}Wx^2$, if y $=\delta$

And $\frac{dy}{dx}=0$ at x=l and

$\frac{d^2y}{dx^2}=0$ at x=0, find the maximum deflection of the beam

2017

Q.4   a) Solve by method of variation of parameters   05

$$(D^2 + 1)y = \frac{1}{1 + sinx}$$

b) The income distribution of a group of 10000 persons was found to be normal with mean Rs.7500 and   05
the standard deviation Rs.500. What is the number of persons of this group which have income
   i) exceeding Rs.6680 ii) exceeding Rs.8320.

c) If a weight 6 lbs hangs from a spring with constant K =12 and no damping force exists, find the motion   05
of weight when an external force 3 cos8t acts, initially x=0, $\frac{dx}{dt} = 0$ Determine whether resonance occurs.

Q.5   a) Solve $x^2 \frac{d^3y}{dx^3} + 3x \frac{d^2y}{dx^2} + \frac{dy}{dx} = x^2$ log x   05

b) Fit the curve y = ae^{bx} for the data   05

X:	1	2	3	4	5	6
Y:	1.6	4.5	13.8	40.2	125	300

c) The first three moments of a distribution about the value 2 are 1, 16 and -40. Find mean, variance and   05
μ_3
Also find the first three moments about x=0

Section B

Q.6   Solve any five   10
a) Find the first approximate value of the root (i.e. X_1) by Newton – Raphson method for x e^x-2=0,
correct to 3 decimal place.
b) find f (8) for the data

x	5	6	9
f(x)	12	13	14

c) Find the values of x, y, Z in the
first iteration by Gauss seidel
method for

   54x + y + z = 110
   2x + 15y + 6 z = 72
 -x + 6y + 27 z =85

d) Find grad φ at (1, -2, -1), if
φ = 3x^{2}y-y^{3}z^2
e) show that the vector
$\bar{v} = e^x$sinyi + e^x cosyj is irrotational
f) Evaluate $\int_c \bar{F}.d\bar{r}$ Where F = x^{2}i + xyj
c: y = 0
between points (0,0) to (a,0)

g) find $\nabla^2 (r \log r)$
h) Write statement of Stoke's theorem.

Q.7   a) Solve by Gauss Seidel Method   05
   10x + 2y + z = 9
   2 x + 20 y - 2z = -44

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-2x + 3y + 10z̄ =22

b) Find the directional derivative of   05
$f = x^2 - y^2 + 2 z^2$ at the point
(1,2, 3) in the direction towards the point (2,1,4)

c) Show that vector field   05
$\bar{F}$= 2x (y^2 + z^3)i + 2x^{2}yj + 3x^{2}z^{2}K
Is conservative. Find the work done in moving a particle from
(-1,2, 1) to (2, 3, 4)

Q.8   a) Find a root of the equation correct to three decimal places   05
logx – cosx = 0

b) Show that f(r)$\bar{r}$ is always irrotational   05

c) Evaluate by Green's theorem   05
$\int_c \bar{F}.d\bar{r}$, where $\bar{F}$ = x^{2}i + xyj
And c is a triangle having
Vertices A (0,2) , B(2,0) and C (4,2)

Q.9   a) Find $\frac{dy}{dx}$ at x = 1.9 for the data   05

x	1.1	1.3	1.5	1.7	1.9
y	0.21	0.69	1.25	1.89	2.61

b) Using stoke's theorem evaluate   05

$$\int_c [(x + y)dx + (2x - z)dy + (y + z)dz]$$

Where c is the boundary of the triangle with vertices (2,0,0), (0,3,0) and (0,0,6)

c) Show that $\bar{F}$ = (6xy + z^3)i + (3x^2-z)j + (3xz^2-y)k is irrotational. Find scalar φ such that F = ∇φ.   05

Q.10   a) Use Runge Kutta method of order 4   05
to approximate y when x=1.1,
given that y(1) = 1.2 and
$\frac{dy}{dx}$ = 3x + y^2, take h=0.1

b) Solve by Euler's modified method   05
$\frac{dy}{dx}$ = -xy^2, y(0) = 2

find y (0,2) by taking h = 0.2

c) Evaluate   05
$\iint_s \bar{F}.\hat{n}\, ds$ where

$\bar{F}$= 4xz̄i -y^{2}j + yzK and S is the surface of the cube
bounded by x=0, x = 1, y=0, y=1,z=0, z=1

2017

SUBJECT CODE NO:- P-42
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E.(MECH/PROD) Examination May/June 2017
Machine Drawing
(Revised)

[Time: Four Hours]   **[Max.Marks:80]**
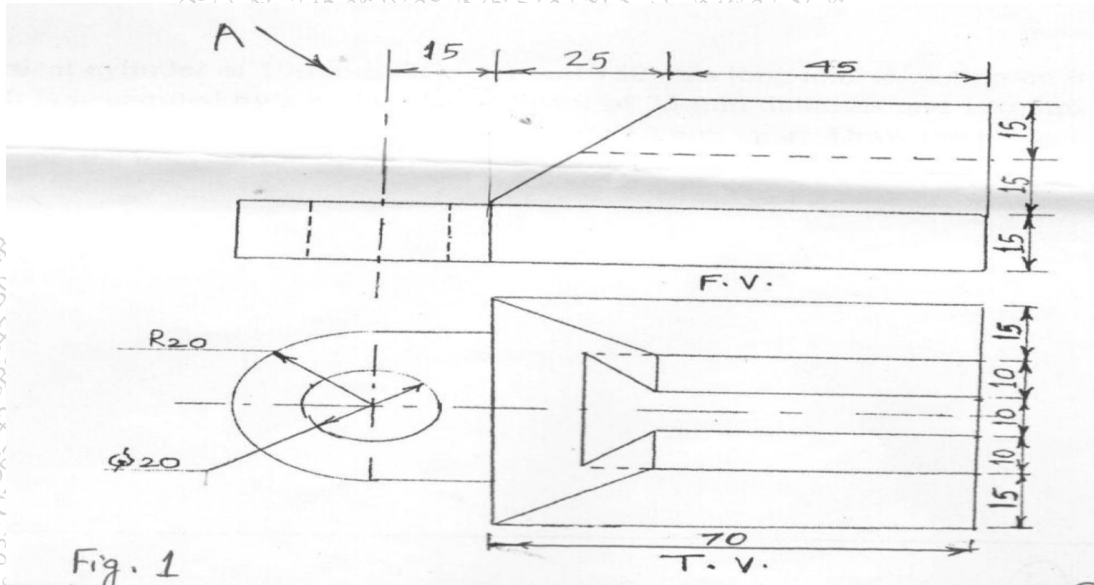
Please check whether you have got the right question paper.

N.B   i.   All the questions are compulsory.
             ii.   Figures to the right indicate full marks.
             iii. Assume suitable data, if and wherever necessary.

Section A

Q.1   a)   Draw involute of a pentagon of 40mm side. Also draw a normal and tangent to it at a point 100mm   08
            from the center of the pentagon.

       b)   The vertex of a hyperbola is 65mm from its focus. Draw the curve if the eccentricity is 3/2. Draw a   08
            normal and tangent at a point on the curve, 75mm from the directrix. Fig. no. 1 shows front view,
            incomplete top view and partial auxiliary view of an object.

Q.2   Draw the following views"-   12
       i.   Front view and top view
       ii.   Left hand side view
       iii. Auxiliary view from the direction 'A'

Fig. 1

OR

Q.2   Two views of an object are shown in the fig. no. 2.Draw its isometric view.   12
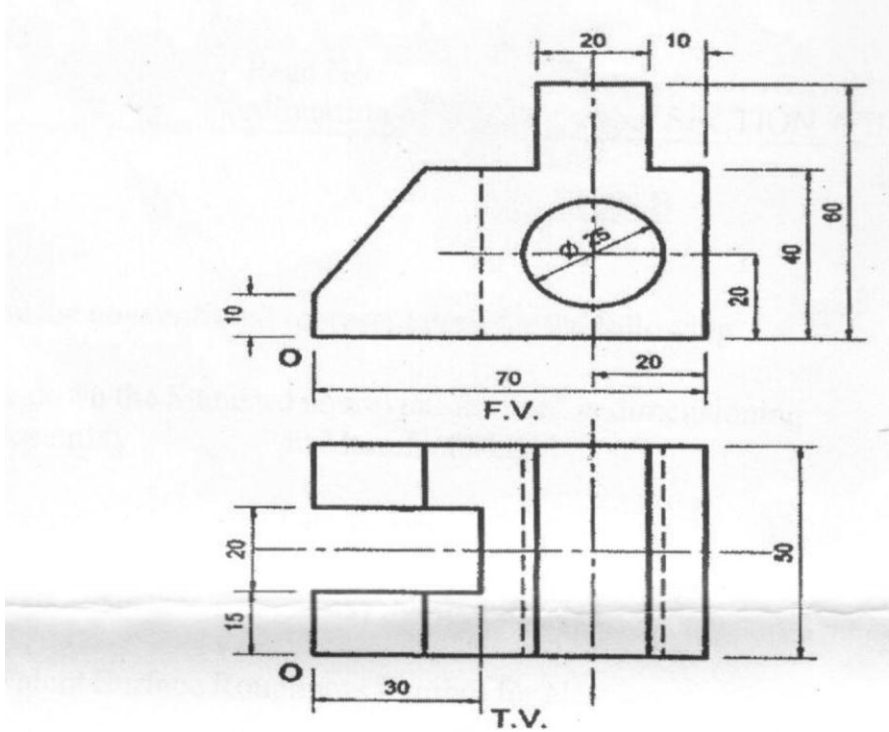

Fig. No.2

Q.3   Two equal prisms whose ends are equilateral triangles of 40mm side and axes 100mm long. Interact at right   12
angles. One face of each prism is on the ground. The axis of one of the prism is inclined at 30° to the V.P. Draw
the three views showing the lines of intersection.

OR

Q.3   A vertical cylinder of 100mm diameter and 150mm long axis is resting on its base on H.P. It penetrated by a   12
horizontal cylinder of 75mm diameter and 120mm long axis, their axes are at right angles to each other but
10mm apart. Draw the projections of the curves of the intersection on a plane parallel to the axes of the
cylinders.

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Section B

Q.4   Draw the conventional representation for the following.   15
    i.   Write down the standard abbreviations used in dimensioning
        a)   Assembly
        b)   Manufacturing

    ii.   Geometrical tolerance of symmetry.
    iii.   Equivalent surface roughness symbol for N11.
    iv.   Equivalent surface roughness symbol for N1.
    v.   Semi elliptic leaf spring
    vi.   Geometrical tolerance of position
    vii.   Surface texture obtained by any production method.
    viii.   Liquid
    ix.   Straight knurling
    x.   Spot weld
    xi.   Conventional signs of weld
    xii.   Seam weld
    xiii.   Transition fit
    xiv.   Spur gear
    xv.   Oblique dimension of Aligned system.

Q.5   Refer to given figure no. 3 which shows details of a Steam Stop Valve. Assemble the parts along with part   25
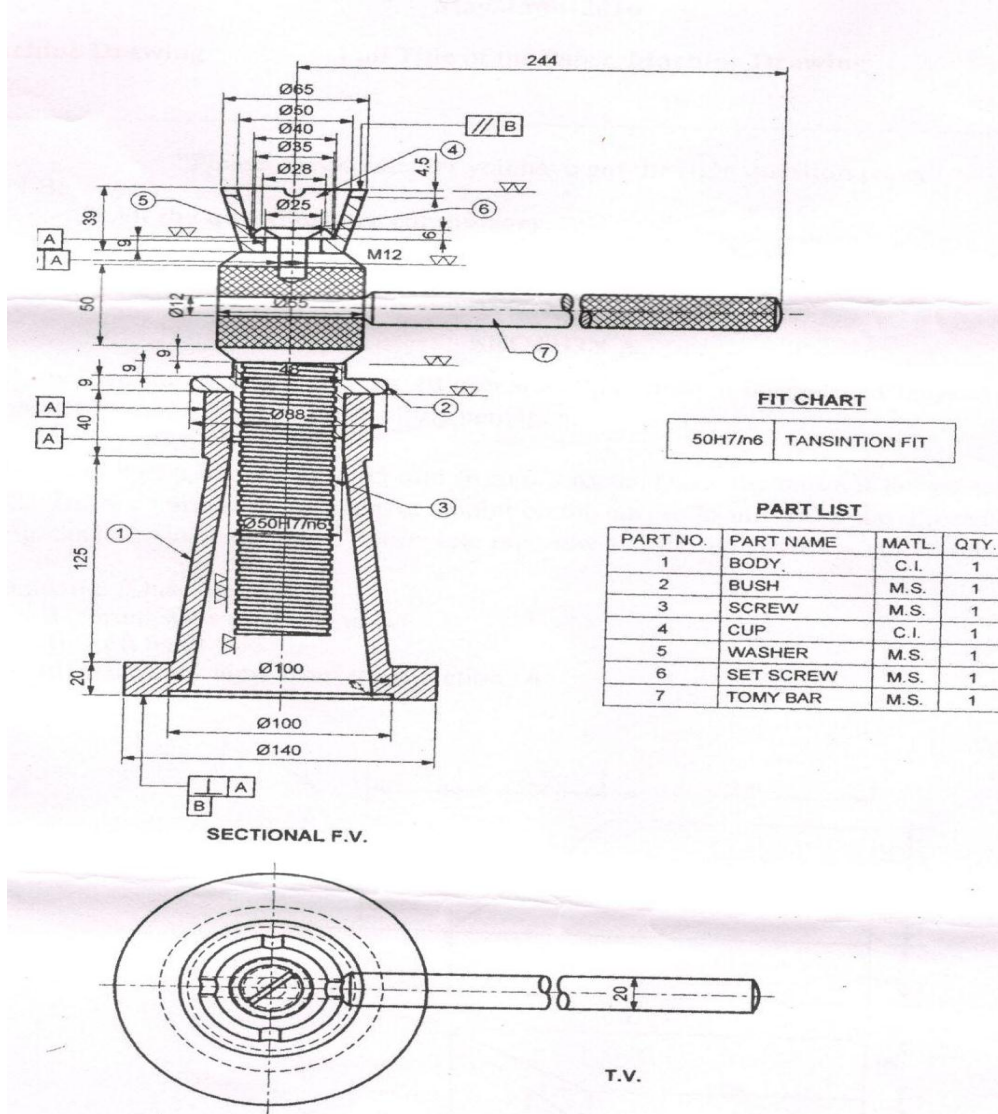   numbering and part list and draw the following views:
    i.   Sectional front view and
    ii.   Top view

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Figure 3 – STEAM STOP VALVE

OR

Q.5   Figure no 4 shows assembly drawing of Screw Jack. Draw the details of the parts.   25

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PART LIST

PART NO.	PART NAME	MATL.	QTY.
1	BODY.	C.I.	1
2	BUSH	M.S.	1
3	SCREW	M.S.	1
4	CUP	C.I.	1
5	WASHER	M.S.	1
6	SET SCREW	M.S.	1
7	TOMY BAR	M.S.	1

SECTIONAL F.V.

T.V.

Fig. 4 : Assembly of Screw jack coupling

2017

SUBJECT CODE NO:- P-73
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E.(MECH/PROD) Examination May/June 2017
Thermodynamics-I
(Revised)

[Time: Three Hours]   [Max.Marks:80]

Please check whether you have got the right question paper.

N.B
     i) Q.No.1 and Q.No.6 are compulsory.
     ii) Solve any two questions from remaining questions in each section.
     iii) Use of steam table/mollier diagram allowed.
     iv) Assume suitable data, if required.

Section A

Q.1   Solve any five   10
     a) Draw isochoric process on P.V & T.S diagram.
     b) Draw isentropic process on P.V & T.S diagram
     c) State limitations of 1st law of thermodynamics.
     d) Explain pmm-I
     e) Explain unavailable energy
     f) Write Kelvin-plank statement
     g) A heat engine working on Carnot cycle operates between temp limits of 600k & 300k. calculate least rate of heat rejection per KW of power output.

Q.2   Air. Enter at 15^0c through a heat exchanger at a velocity of 30 m/s where its temperature is raised to 15
     750^0c.IT then enters a turbine with same velocity of 30 m/s & expands until the temperature falls to
     650^0c on leaving the turbine, air is taken at a velocity of 60 m/s to a nozzle where it expands until the
     temperature has falls 500^0c.If the air flow rate is 2 kg/s calculate,
     a) Rate of heat transfer to air in heat exchanger.
     b) Power output of turbine assuming no heat loss.
     c) Velocity of air at the ext from nozzle, assuming no heat loss.

Q.3   a) Prove the equivalence of Kelvin plank & clausius statement.   07
     a) b) A reversed Carnot cycle operates as refrigerator has capacity of 100 kJ/s while operating 08
        between temperature limits of -20^0c & 35^0C Determine power input & COP. if the system is used
        for heating purpose only, find its COP

Q.4   a) State & prove clausius inequality.   07
     b) State & prove Carnot theorem.   08

Q.5   Write short note on (any 3)   15
     a) Available and unavailable energy.
     b) Statements of Second law of thermodynamics.
     c) pmm-I & pmm-II
     d) SFEE

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Section B

Q.6 Solve any five. 10
a) What is critical point
b) Define latent heat & sensible heat
c) What do you mean by HCV & LCV.
d) Draw Atkinsons cycle on P-V & T-S diagram
e) Define (I) dryness fraction (II) Dry steam.
f) Define mean effective pressure.
g) Explain triple point.

Q.7 a) Derive the expression for ideal efficiency of Diesel cycle. 07
b) Calculate the % loss in air standard efficiency of Diesel engine with compression ratio of 14 & fuel 08
cut off is delayed from 5 % to 8 %

Q.8 a) With neat sketch. Explain construction & working of separating- Throttling calorimeter. 06
b) Calculate volume , density, enthalpy & entropy of 1.5kg of steam at 20 bar & having dryness 09
fraction of 0.95

Q.9 A fuel has mass composition as. 15
C=85%, H_2=13%, O_2=2 % The dry exhaust gases have the following volumetric composition, CO_2=9%,
CO=1.5 %, O_2=7%, N_2=82.5%

Determine :
a) Mass of air supplied per kg of fuel
b) % of excess air supplied.

Q.10 Write short note on(Any three) 15
a) Or sat apparatus
b) Mollier diagram
c) Brayton cycle
d) Compare Otto & Diesel cycle for same compression ration & same heat addition.

2017

SUBJECT CODE NO:- P-106
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E.(Mech/Prod) Examination May/June 2017
Production Processes-I
(Revised)

[Time: Three Hours]   **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B   i) Q. No.1 and 6 are compulsory.
                ii) Attempt two questions from the remaining questions from each section A and B.
                iii) Draw neat labeled sketches whenever necessary and assume suitable data whenever necessary.

Section A

Q.1   Solve 'any five'. From the following.   10
            1. What are the different types of patterns?

            2. What is the function of runners, gate and risers in a sand mould?

            3. What is pressure die casting? Where is it used?

            4. List the inspection methods used in detection of defects in casting.

            5. Classify the hot working and cold working methods used in metals.

            6. What is difference between rolling and wire drawing?

            7. What is the difference between open die and closed die forging?

            8. List the operations carried out in sheet metal working?

            9. What is a press brake? Where is it used?

            10. Differentiate between cold and hot forging in brief.

Q.2 (a)   What are the different types of moulding sands? What are the sand additives? Discuss in details.   07
      (b)   Explain with neat sketch an open hearth furnace. Discuss its advantages, disadvantages and applications.   08
Q.3 (a)   With a neat sectional view explain a cope and drag sand mould and explain the procedure for making of   08
            sand mould using a split pattern.
      (b)   With neat sketch explain centrifugal coating in metals. State its application.   07
Q.4 (a)   With neat sketch explain different arrangements in the hot rolling mills. Explain the advantages,   08
            disadvantages and applications of hot rolling.
      (b)   Explain with neat sketch the pipe production process, using roll forming and seam weld.   07
Q.5 (a)   With neat sketch explain the different operations in sheet metal working, giving function of each of them.   07
      (b)   What are the different types of pressure used in sheet metal working? Explain in brief with a block   08
            diagram a hydraulic press.

2017

Section B

Q.6   Solve 'any five' from the following:-   10
1. What are the different types of plastics? Briefly state their difference.

2. What is Laminating plastics?

3. Give the classification of the following processes.

4. What are fluxes used in welding. Why are they used?

5. What is the principle of working of the resistance welding process?

6. Name the different defects in welding.

7. What is the purpose of surface treatment on the products?

8. What is anodizing?

9. What are the special welding processes?

10. What is the difference between spray painting and powder coating?

Q.7 (a)   With neat sketch explain the construction and working of an injection moulding machine, (Horizontal)   09
     Used for mass production.

(b)   What is the difference between blow moulding and vacuum forming? Give examples of each of them.   06

Q.8 (a)   What are the different arc welding processes? Explain with neat sketch, a M.I.G welding process.   08

(b)   What are the destructive and Non-destructive tests carried out on the welded joints? Why are they   07
     carried out?

Q.9 (a)   With neat sketch explain the thermitt welding process. Give its applications.   08

(b)   Differentiate between:-   07
     (a) Arc welding and Resistance welding processes
     (b) MIG and TIG welding

Q.10 (a)   What are different cleaning processes? Why are they essential for surface treatment? Explain chemical   08
     cleaning.

(b)   Explain in detail electroplating process. Give examples, advantages and disadvantages.   07

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SUBJECT CODE NO:- P-140
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E.(Mech/Prod) Examination May/June 2017
Strength of Material
(Revised)

[Time: Three Hours]   [Max.Marks:80]
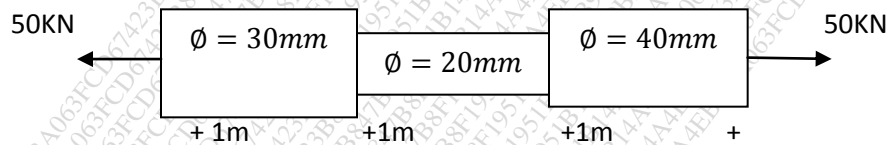
Please check whether you have got the right question paper.

N.B
       i) Q.No.1 and Q.No.6 are compulsory.   Attempt <u>any two</u> questions from the
       remaining questions in each section
       ii) Figure to the right indicate full marks
       iii) Assume suitable data if necessary

Section A

Q.1   Attempt <u>any five</u>   10
1) Define sagging bending moment
2) Explain Poisson ration
3) Define lateral strain
4) Define modulus of elasticity
5) Define section modulus
6) Define thermal stress
7) Define point of contra flexure

Q.2   a) A copper bar loaded as shown in figure determine total elongation. E=150 GPa   07

50KN $\emptyset = 30mm$ $\emptyset = 40mm$ 50KN
                      $\emptyset = 20mm$

   + 1m   +1m   +1m   +

     b) A steel cube of 150mm side is subjected to force of 12KN(T), 14KN (C) & 10KN (T) along X, Y, Z   08
        direction respectively determine the changes in volume of steel cube E=200 KN/mm^2 $\mu =$
        0.25 also find strain in X-direction

Q.3   a) Write down the different types of load   03
     b) Draw S.F.D & B.M.D for the following loaded beam & also calculate maximum Bending moment   12

               10KN
                  5KN/m   10KN/m
      A   C   D   B
         2m   c 3m
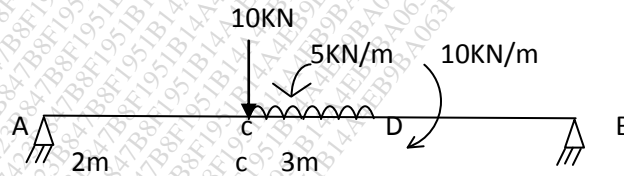
Q.4   a) A simply supported beam is required to carry a central concentrated load of 70 KN. span of beam   08
        is 4m if allowable stress is 20mpa & radius of curvature is 120mm . find minimum dimension of
        cross –section of the beam if it is to be
        i)   Rectangular (dept =2 width)
        ii)   Circular (E=200Gpa)

     b) Show that bending shear stress at a point within C/S is given by $\tau = \frac{SA\bar{Y}}{Ib} with$ usual notations   07
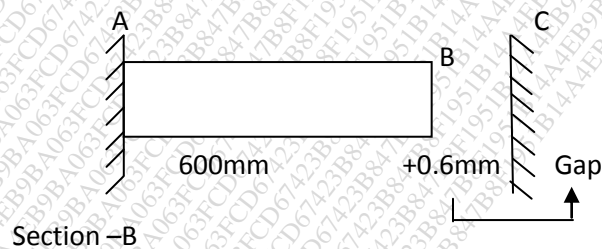
Q.5   a) A bar of uniform C/S area 10cm^2 is subjected to the forces as shown in figure, calculate change in   07
           length of the bar. take E=2 X 10^{5}N/mm^2

+ 30cm +   40cm   +   60cm   +
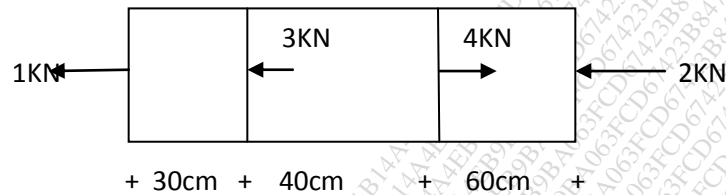
b) Figure shows copper rod AB of length 600mm when the temperature of rod is 25°C the gap of BC   08
    is 0.6mm determine stress & strain in rod when its temperature is 100°C

E=100Gpa
$\propto= 16 \times 10^{-6/c}$

Section –B

Q.6   Attempt <u>any five</u>   10
   1) Define condition for no tension
           2) Torsional rigidity
           3) Define polar modulus
           4) Define middle third rule
           5) What is core or kernel of a section
           6) Why hollow shaft is economical than solid shaft
           7) Define strain energy

Q.7   a) A short column of external diameter 450mm and internal diameter 225mm carries on eccentric   07
           load 90KN .find the greatest eccentricity which the load can have without producing tension of
           the cross –section
       b) Hallow shaft is to have an outside diameter is 'd' and inside diameter is d/2 calculate the   08
           minimum value of 'd' if is to be transmit 350kW at 100 RPM with working stress of 35N/mm^2
           determine twist in length 10 times the external diameter
   Take G=8X10^4 N/mm^2

Q.8   a) A compound shaft is made of steel shaft & brass tube as shown in fig. what is twisting moment at   08
           free end if allowable shear stress in steel & brass are 70 MPa &50 mpa respectively maximum
           angle of twist should not exceed 2°
           G steel= 80X10^{3}mpa
   G brass = 35 X10^{3}mpa

+ 60cm   + 80cm   +
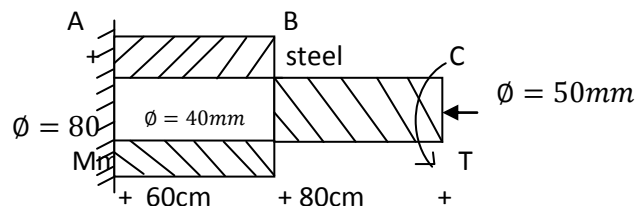
b) A bar of 60mm diameter 200cm long is fixed at upper end and provided with a collar at the lower   07
end.   A weight of 500 KN is dropped on the collar from the height ot 250mm take E=200Gpa &
find

Instances stress, elongation & strain energy

Q.9   A simple supported beam carrying a point load is shown in fig. determine slope at point A & B and   15
maximum deflection .using Mc culays method take E=200 GPa
I=60 X 10^6mm^4
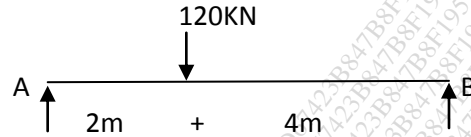
Q.10   The tensile stresses at a point across two mutually perpendicular planes are 100N/mm^2 & 40N/mm^2 find   15
graphically the normal and tangential stresses on a plane inclined at 30° with the major principal plane
Also find resultant stress & angle of obliquity use Mohr's circle method
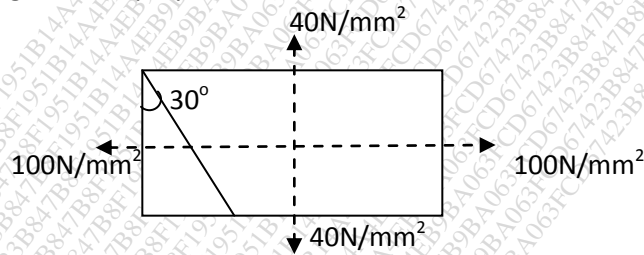
2017

SUBJECT CODE NO:- P-220
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (All Branches) Examination May/June 2017
Engineering Mathematics -IV
(Revised)

[Time: Three Hours]   **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B
     i) Q.No.1 from and Q.No.6 are compulsory.
     ii) Solve any two questions from remaining of each section.
     iii) Figures to the right indicate full marks.
     iv) Assume suitable data, if necessary.

Section A

Q.1 Solve any five from the following: 10

a. Find the analytic function whose imaginary part is $e^x \sin y$.

b. Show that $u = \bar{e}^\theta \cos(\log r)$ is harmonic.

c. Find the image of the line y=2x, under the transformation $W=Z^2$

d. Evaluate $\int_0^{1+i}(x^2 - iy)dz$ along the line y=x.

e. Evaluate $\int_c \frac{e^z}{z}dz$, where c is $|z|=1$

f. Find the poles of the function and the corresponding residues at each pole of $f(z) = \frac{ze^z}{(z+1)^3}$

g. Solve $\frac{\partial u}{\partial x} = \frac{2\partial u}{\partial t} + u$, where u(x, 0)=$6e^{-3x}$.

OR

Find the Z-transform of f(k) =k, k≥ o.

h. Solve $\frac{\partial^2 z}{\partial x \partial y}$=sinx.

OR

Find the Z-transform of e^{-ak}, k≥0,

Q.2 a. Show that the function $f(z)=e^x(\cos y + i \sin y)$ is analytic and find its derivative.   05
b. Find the bilinear transformation which maps the point z=-1, 0, 1 onto the points W=0,i,3i.   05
c. Find the Z-transform of $\frac{\cos 2k}{k}$, k≥o.   05

OR

Solve $\frac{\partial^2 y}{\partial t^2} = C^2 \frac{\partial^2 y}{\partial x^2}$, subject to the conditions   05
Y(0,t)=0, Y(l,t)=0, $\partial y/\partial t$ =0 at t=0
And   y(x,0)=$\frac{3a}{2l}$x, 0≤ x ≤ $\frac{2l}{3}$
      =$\frac{3a}{l}$(l-x), $\frac{2l}{3}$ ≤ x ≤ l.

Q.3 a. Find k such that f(x, y)=x^3+3kxy^2 may be harmonic and find its conjugate harmonic function.   05
b. Evaluate $\int_c \bar{z}^2 dz$, Where c is $|Z - 1|=1$.   05
c. Find the inverse Z-transform of $\frac{Z}{(z-2)(z-3)}$, $|Z| > 3$.   05

OR

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Solve $\frac{\partial u}{\partial t}=\alpha^2\frac{\partial^2 u}{\partial x^2}$ for $o< x < \pi, t > o$ 05

$\frac{\partial u}{\partial x}$ =0 at x=0, $\frac{\partial u}{\partial x}$=0 at x= π and u(x, o) =sinx.

Q.4 a. Expand f(z)=$\frac{1}{(z+1)(z+2)}$ for 0< $|Z-1|$ < 1. 05

b. Evaluate $\oint_c \frac{sinz}{(z-1)^2(z^2-9)}$ dz, where c is $|Z-3|=\frac{1}{2}$. By cauchy's integral formula. 05

c. Solve the difference equation by Z-transform $u_{K+2}-2u_{k+1}+u_k=2^K$, with $Y_o=2, Y_1=1$. 05

OR

Solve $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$, subject to the conditions 05

u(0, y) = u(π, y)=0 for all y $\geq$ 0 and u(x, 0)=100 u(x, ∞)=0.

Q.5 a. Under the transformation W=Z+$\frac{a^2}{z}$, show that the map of the circle $x^2+y^2=a^2$ is a straight line, but the map of 05
the circle $x^2+y^2=b^2$ (b>a) is an ellipse.

b. Evaluate $\oint_c \frac{z^2}{sin^3z\, cosz}$ dz, where c is $|Z+i|$=2 by cauchy's Residue theorem. 05

c. Evaluate $\int_{-\pi}^{\pi}\frac{1}{1+sin^2\theta}$ dθ, by using Residue theorem. 05

Section-B

Q.6 Solve any five from the following: 10
a. Find Laplace transform of $te^{-2t}\delta(t-2)$.
b. Find $L[f(t)]$ and $L[f'(t)]$ of the following function f(t)=3, $0\leq t < 5$
=0, t>5.
c. Find the Laplace transform of f(t)= $(t-2)^2$,t>2
=0, t<2
d. Find inverse Laplace transform of$\frac{2s+2}{s^2+2s+10}$

e. Find inverse Laplace transform of $\frac{e^{-\pi s}}{s^2+9}$
f. find inverse Laplace transform of $s^{\frac{-7}{2}}$
g. Find the Fourier cosine transform of f(x)=k, 0<x<a
=0,x>a
h. Find the Fourier transform of f(x)= x, 0<x<a
=0, other wise

Q.7 a. Find the Laplace transform of$\int_o^t \frac{1+\bar{e}^t}{t}$dt. 05

b. Find the inverse Laplace transform of $tan^{-1}\frac{2}{5}$ 05

c. Using Fourier transform , solve the equation $\frac{\partial u}{\partial t}$ =2$\frac{\partial^2 u}{\partial x^2}$, 0<x<$\infty$, t>0 05
Subject to the conditions
u(0,t)=0, t>0,   u(x,0)=e^{-x}, x>0,
u and $\frac{\partial u}{\partial x}$ →0 as x→ ∞.

Q.8 A. Evaluate $\int_0^{\infty} e^{-5t}sinh^3t$ dt 05

b. Find the inverse Laplace transform by convolution theorem of $\frac{1}{s(s^2+4)}$ 05

c. Find f(x) satisfying the integral equation $\int_0^{\infty} f(x)sin\lambda xdx=\frac{sin\lambda}{\lambda}$ 05

Q.9 Express the following function in terms of Heaviside unit step function and hence find their Laplace transform 05
F(x)=sin t, 0<t<π
=t, t>π

2017

b. Solve $y'' - 6y' + 9y = t^2 e^{3t}$, y(0)=2, y' (0)=6 by Laplace transform.   05

c. Find the Fourier sine transform of   05

       f(x)=x, 0<x<1

          =2-x, 1<x<2

          =0, x>2

Q.10 a. Find the Laplace transform of f(t)= e^t, 0<t<2π , f(t)=f(t+2π).   05

b. Solve $\frac{dx}{dt}$+y=sin t , $\frac{dy}{dt}$+x=cost, X(0)=2, y(0)=0 by Laplace transform.   05

c. Find the Fourier transform of f(x)=$\frac{1}{2a}$, if $|x| \leq$a   05

          =0, if $|x|$>a.

2017

SUBJECT CODE NO:- P-244
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E.(Mech./Prod.) Examination May/June 2017
Theory of Machines-I
(Revised)

[Time: four Hours]   [Max.Marks:80]

Please check whether you have got the right question paper.
N.B   i) Q. No.1 and 6 are compulsory. Solve any two questions out of the remaining in each section.
             ii) Draw neat sketches wherever necessary.
             iii) Assume suitable additional data if required.

Section A

Q.1   Solve the following questions. (Any five).   10
    1)   When the elements of the pair are kept in contact by the action of the external forces, the pair is said to be a.
         (a) Lower pair   (b) Higher pair
         (c) Self closed pair   (d) Force closed pair

    2)   In a mechanism, the fixed instantaneous centers are those centers which.
         (a) Remain in the same place for all configurations of the mechanisms
         (b) Vary with the configuration of the mechanism
         (c) Moves as the mechanism moves, but joints are of permanent nature.
         (d) None of the above

    3)   The direction of the linear velocity of any point on a link with respect to another point on the same link is.
         (a) parallel to the link joining the points
         (b) perpendicular to the link joining the points
         (c) at 45^0 to the link joining the points
         (d) None of these

    4)   The Coriolis component of acceleration is taken into account for.
         (a) Slider crank mechanism   (b) Four bar chain mechanism
         (c) Quick return motion mechanism   (d) None of these

    5)   The example of rolling pair is.
         (a) Bolt and nut   (b) Lead screw of a lathe
         (c) Ball and socket joint   (d) Ball wearing and roller wearing
         (e) All of the above

    6)   The purpose of a link is to.
         (a) Transmit motion   (b) Guide other links
         (c) Act as a support   (d) All of the above

    7)   The acceleration of particle at any instant has two components i.e. radial component and tangential component. These two components will be.

(a) Inclined at 45^0 (b) Opposite to each other
(c) Parallel to each other   (d) Perpendicular to each other

8) When a slider moves on a fixed link having curved surface, their instantaneous centers lies.
    (a) On their point of contact   (b) At the center of curvature
    (c) At the pin joint   (d) At the center of circle

9) Angular acceleration of a link can be determined by dividing the
    (a) centripetal component of acceleration with length of link
    (b) Tangential component of acceleration with length of link
    (c) Resultant acceleration with length of link
    (d) All of the above

10) Coriolis component of acceleration exists whenever a point moves along a path that has.
    a) Linear displacement
    b) Rotational motion
    c) Tangential acceleration
    d) Centripetal acceleration

Q.2   The dimensions of various links in a mechanism, as shown in Fig.1 are as follows: AB = 60mm,   15
        BC = 400mm, CD = 150mm, DE = 115mm and EF = 225mm. Find the velocity of slider F when crank AB
        rotates uniformly in clockwise direction at a speed of 60 rpm.

Q.3   In the mechanism shown in the following figure 2, link AB rotates clockwise about A at 75 rpm. For the   15
        mechanism shown, locate all the instantaneous centers of rotation and hence find the velocity of piston C
        and E.

Q.4   For the steam engine mechanism shown in fig 3, determine the sliding acceleration of the slider F and the 15
        angular acceleration of link CE, for a crank speed of 143 rpm. Dimensions of the various links are:
        OA = 300mm, AB = 120mm, BC = 450mm, CE = 1200mm and EF = 1200mm.

Q.5   Figure 4 shows a four bar mechanism, using shortcut method determine,   15
        1. Velocity and acceleration of point C,
        2. Angular velocity and angular acceleration of link BC, and CD.

Section B

Q.6 Solve the following questions. (Any five).   10
    I.   In reciprocating engines primary forces
    a)   Are completely balanced
    b)   Are partially balanced
    c)   Are balanced by secondary forces
    d)   Cannot be balanced

    II.   A rigid body, under the action of external forces, can be replaced by two masses placed at a fixed distance
          apart. The two masses form an equivalent dynamical system, if.
    a)   The sum of two masses is equal to the total mass of the body.
    b)   The center of gravity of two masses coincides with that of the body
    c)   The sum of mass moment of inertia of the masses about their center of gravity is equal to the mass
          moment of inertia of the body.
    d)   All of the above

    III.   The cam profile and pitch curve are same for.
    a)   Roller follower

2017

b) Flat faced follower
c) Mushroom follower
d) Knife edge follower

IV. The brakes commonly used in railway trains is.
a) Shoe brake
b) Band brake
c) Band and block brake
d) Internal expanding brake

V. Static balancing involves balancing of-------------.
a) Forces
b) Couples
c) Both
d) Masses

VI. Hammer blow in locomotives result in.
a) Pulsating torque
b) Uneven speed
c) Tendency to lift wheels from rails
d) Variable horizontal force

VII. Angle of ascent of cam is defined as the angle.
a) During which the follower returns to its initial position
b) Moved by the cam from the instant the follower begins to rise, till it reaches its highest position.
c) During which the follower remains in highest position.
d) Moved by the cam from beginning of ascent to the termination of descent.

VIII. A circle passing through the pitch point with its center at the center of cam axis is known as.
a) Pitch circle
b) Base circle
c) Prime circle
d) Outer circle

IX. The magnitude of the secondary force is----------the primary force.
a) More than
b) Less than
c) Equal to

X. If rotating system is dynamically balanced, it is statically----------.
a) Balanced
b) Unbalanced
c) Partially balanced

Q.7 A single cylinder horizontal steam engine has a stroke of 0.75 m and a connecting rod 1.8m long. The mass of reciprocating parts is 520 kg and that of the connecting rod is 230 kg. Center of gravity of the connecting rod is 0.8 m from the crank pin and the moment of inertia about an axis through the center of gravity perpendicular to the plane of motion is 100 kg m^2. For an engine speed of 90 rpm and a crank position of 45^0 from the inner dead center, determine torque of the crankshaft due to the inertia of these parts by graphical method. 15

2017

Q.8 The following data relate to a cam operating an oscillating roller follower:- 15
Minimum radius of cam = 30mm, radius of roller = 10mm, distance of fulcrum center from cam center = 55mm, length of follower arm = 45mm, angle of ascent =80^0, angle of descent = 100^0, angle of dwell between ascent and descent = 50^0, angle of oscillation of follower = 30^0, Draw the profile of the cam if the follower moves outward with S.H.M. and returns with uniform acceleration and retardation.

Q.9 A,B,C and D are four masses carried by a rotating shaft at radii of 10 cm, 12.5 cm, 20 cm and 15 cm respectively. 15 The planes in which the masses revolve are 60 cm apart and the mass of B, C and D are 10 kg, 5 kg and 4 kg respectively. Find the required mass A and the relative angular setting of the four masses so that the shaft is in complete balance. (Assuming the plane of the mass as the reference plane).

Q.10 A 2-cylinder uncoupled locomotive with cranks at 90^0 has a crank radius of 32.5 cms. The distance between centers 15 of driving wheel is 150 cms. The pitch of cylinders is 60 cms. The diameter of Treads of driving wheels is 180 cms. The radius of center of gravity of balance weighs is 65 cms. The pressure due to dead load on each wheel is 4 tones. The weight of the reciprocating and rotating parts per cylinder are 330 kg respectively. The speed of locomotive is 60kmph. Find:
   a) The balancing weights both in magnitude and position required to be placed in the planes of driving wheels to balance whole of the revolving and 2/3 of reciprocating masses.
   b) Swaying couple
   c) The variation of tractive force
   d) The maximum and minimum pressures in rails. What is the maximum speed at which it is possible to run the locomotive, in order that the wheels are not lifted from the rail?

Figure 1

AB=75
BC=300
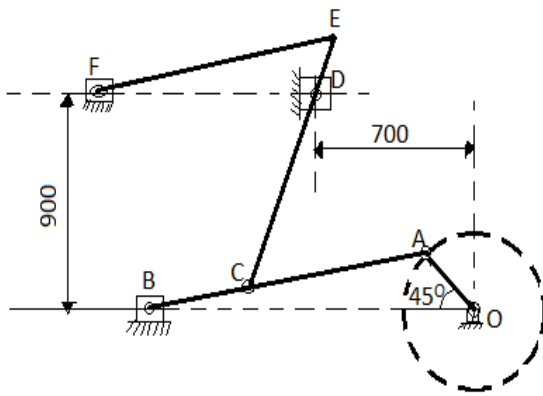BD=CD=DE
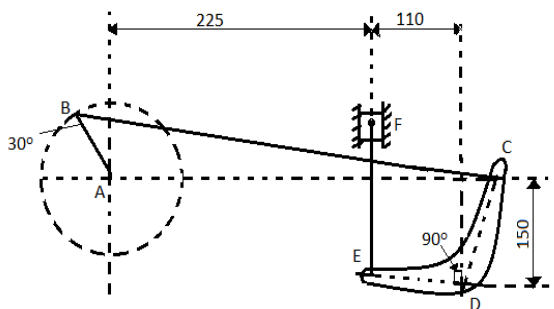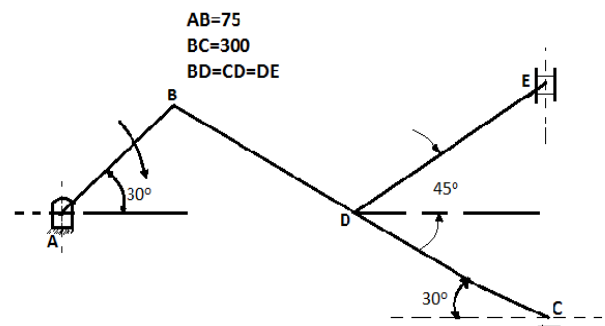
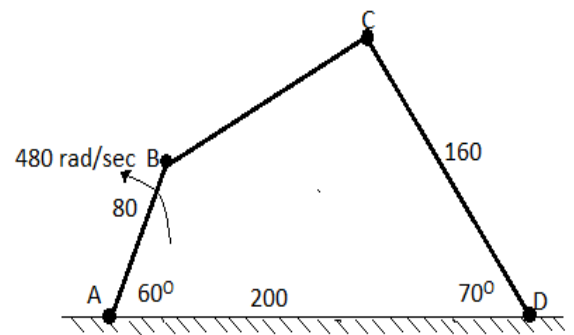**Figure 2**

2017

Figure 3

Figure 4

All dimensions are in mm.

SUBJECT CODE NO:- P-275
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E.(Mech./Prod) Examination May/June 2017
Thermodynamics-II
(Revised)

[Time: Three Hours]   **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B   i)Question no. 1 & 6 are compulsory from each section A & B.
ii)Solve any two questions from remaining questions in each section A & B.
iii)Steam table, mollier diagram is permitted.
iv) Assume suitable data, if required.

Section A

Q.1   Solve any five   10
i) Write major components of process Boiler.
ii) Differentiate between internally fired & external fired boiler.
iii) Define equivalent evaporation & factor of evaporation.
iv)What is Natural draught ?
v)List Applications of steam.
vi)Explain Induced draught.
vii)Define chimney efficiency.
viii)Define nozzle efficiency.

Q.2   a)A steam generator generates 300 kg of steam per hour at 12.5 bar & 0.97 dry from feed water at   08
105°C. The coal fired is 2040 kg/hr & its C.V = 27.4 MJ/kg. Find
i)equivalent evaporation
ii)Boiler efficiency
b)Explain Benson Boiler.   07

Q.3   a)Derive the equation for height & diameter of chimney.   07
b)A Chimney of 16m high is used for discharging maximum exhaust gases   08
i)Find the draught produced by chimney in mm of water
ii)if the maximum temp. of gases available is 350°C, find the mass of air supplied per kg of fuel if discharge
mass is maximum take atmospheric temperature = 20°C.

Q.4   a)What are types of draught. Explain Artificial draught.   07
b)The inlet condition to a steam nozzle are 10 bar & 250°C. The exit pressure is 2 bar. Assuming the   08
isentropic condition & negligible inlet velocity determine i)throat area ii)exit velocity iii)exit area

Q.5   Write short note on (Any three)   15
i)Effect of back pressure on nozzle characteristics
ii) isentropic flow through nozzle
iii)Artificial draught
iv)Heat losses in boiler.

2017

Section B

Q.6 Solve any five. 10
i)Explain jet condenser.
ii)List the method used to improve the performance of Rankine Cycle.
iii)What is compressor
iv)Define FAD
v)Define swept & clearance volume
vi)Define isothermal efficiency of compressor
vii)Explain need of multistage compressor
viii) What is intercooler?

Q.7 a)What are sources of air leakage & what is its effect on performance of condenser. Explain the method 08
used to reduce air leakage.
b)Derive the expression for the mass of circulating water required in condenser. 07

Q.8 a)Explain modified Rankine Cycle. 05
b)A simple Rankine works between pressure of 30 bar & 0.04 bar. The intial temp of steam is 400°C. 10
Calculate i)Turbine work   ii)pump work   iii)Cycle efficiency   iv)work ratio
v)Specific steam consumption.

Q.9 a)Derive the condition for minimum work required for two stage reciprocativa compressor with perfect 07
intercooling.
b)A single acting, two stage air compressor takes air at 1 bar & 300k delivers 10.5 kg/minute at 16 bar 08
when running at 440 rpm. Compression & expansion follows law $PV^{1.3}=c$.
Find   i)minimum power required
ii)isothermal efficiency
iii)Free air delivery (FAD)

Q.10 Write short note on . (Any three) 15
i)Vacuum pumps
ii)Rotary compressor
iii)Carnot cycle
iv)Effect of inlet & back pressure on performance of Rankine Cycle.

2017

SUBJECT CODE NO:- P-307
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (Mech/Prod) Examination May/June 2017
Electrical Machine & Applied Electronics
(Revised)

[Time: Three Hours]   [Max.Marks:80]

Please check whether you have got the right question paper.
N.B
    i.   Q. No 1 and Q. No 6 are compulsory.
    ii.   Solve <u>any two</u> questions from remaining questions in each section.
    iii. Assume suitable data, wherever necessary.

Section A

Q.1   Solve <u>any five</u>   10
    a)   Give the selection criteria of electric drive.
    b)   What are the advantage of DC series motor?
    c)   Define back e.m.f. What is significance of it?
    d)   Explain the necessity of starter in DC motor.
    e)   Differentiate between electrical and mechanical drive.
    f)   State the principle of operation of single phase induction motor. What are its applications?
    g)   Explain the concept of plugging.
    h)   Enlist different methods of speed control in induction motor.

Q.2   a)   Explain the application of electric drive for steel mill.   07
      b)   What are the different electric breaking methods used in DC motors. Explain.   08

Q.3   a)   Classify AC machines: explain slip ring induction motor.   08
      b)   Explain the construction and working of 3 – phase induction motor.   07

Q.4   a)   What are the types of starter for induction motor? Explain autotransformer starter. 08
      b)   Derive the expression for the cooling of the machine. Also define cooling time constant. 07

Q.5   Write a short note on   15
    a)   Star – delta starter
    b)   Rotating magnetic field.

Section B

Q.6   Solve <u>any five</u>   10
    a)   How do you select a sensor?
    b)   What is seebeck effect?
    c)   Draw a neat circuit diagram of light Dimmer.
    d)   Enlist different triggering methods of SCR.
    e)   What is actuator? What are its types?
    f)   Differentiate between depletion and enhancement type of MOSFET.
    g)   Explain the use of heat sink.
    h)   Define
        i.   Holding current &
        ii.   Latching current in SCR

2017

Q.7	a)	State Piezoelectric effect. Explain with neat schematic piezoelectric sensor.	07
	b)	What is mosfet? Explain its construction & working.	08
Q.8	a)	Draw & explain solenoid valve.	07
	b)	With neat diagram explain optocoupler. Draw its types.	08
Q.9	a)	Define temperature sensor. Explain thermocouple.	08
	b)	Explain shaft encoder – decoder sensor.	07

Q.10 Write a short notes on   15
   a) 7 – segment display
   b) Air flow sensor

2017

SUBJECT CODE NO:- P-372
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E.(Mech./Prod) Examination May/June 2017
Production Processes-II
(Revised)

[Time: Three Hours]   **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B
i) Q.No.1 from section A and Q.No.6 from section B are compulsory.
ii) solve any two questions from each section other than Q.no.1 & Q.no.6
iii) figures to the right indicate full marks .

Section A

Q.1		Solve any five of the following.	10
	a)	State the functions of machine tools	
	b)	Which are the principle of metal cutting	
	c)	What is orthogonal cutting	
	d)	Enlist computer application in machine tool.	
	e)	Enlist various lathe operations	
	f)	What is difference between speed lathe & centre lathe	
	g)	What are lathe centers? Enlist various lathe centers.	
	h)	What is slab milling?	
	i)	What is down milling?	
	j)	Enlist different operations on milling machine	
Q.2	a)	What are the effects of cutting speed , feed & depth of cut on tool life	08
	b)	Explain heat sources in cutting.	07
Q.3	a)	With block diagram explain constructional details of centre lathe.	08
	b)	What are the different lathe attachments? explain in details	07
Q.4	a)	Explain gear cutting procedure on milling	08
	b)	Explain principle parts of milling machine.	07
Q.5	a)	Discuss various types of chips with neat sketches.	08
	b)	Explain different types of milling cutters	07

Section B

Q.6		Solve any five of the following	10
	a)	State working principle of planer	
	b)	Classify slotter machines.	
	c)	Enlist different operations performed on shaper.	
	d)	Enlist work holding devices on drilling machine	
	e)	Enlist boring defects.	
	f)	State working principle of cylindrical grinding	
	g)	What are the limitation broaching	
	h)	Give application of EBM.	
	i)	State working principle of AJM .	
	j)	What are the advantages of EDM	
Q.7	a)	With neat sketch explain the principle parts of shaper	08
	b)	Explain different operations performed on slotter machine	07
Q.8	a)	Classify boring machine & explain any one with neat sketch	08

2017

	b)	Explain twist drill nomenclature	07
Q.9	a)	With neat sketch explain electrochemical grinding give its disadvantages	08
	b)	Explain ion beam machining	07
Q.10	a)	Write a short note on 'boring bars & boring heads'.	08
	b)	How the grinding wheels are specified? Explain.	07