Total No. of Printed Pages:2

SUBJECT CODE NO:- K-12

FACULTY OF ENGINEERING AND TECHNOLOGY

S.E. (All Branches) Examination Oct/Nov 2016

Engineering Mathematics -IV

(Revised)

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

Please check whether you have got the right question paper.

N.B
i. Questions numbers 1 and 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:- 10

a) Find the analytic function $f(x) = u + i\vartheta$, whose imaginary part is $\vartheta = \sin hx \cos y$.

b) Find the harmonic conjugate of $u = 4xy + x + 1$.

c) Evaluate $\int_0^{1+\pi i} e^z dz$.

d) Evaluate $\int_{0,1}^{(2,5)} (3x + y)dx + (2y - x)dy$, along $y = x^2 + 1$.

e) Find the residue of $f(x) = \frac{1}{(z^2-1)^3}$ at each pole.

f) Find the image of the circle |Z| = 1, under the transformation W =$\log z$.

g) Solve $\frac{\partial^2 u}{\partial x^2} = 0$, where $u\ (0, y) = y^2$,and $u(l, y) = 1$.

OR

Find the z- transform of $K^2, K \geq 0$.

h) Solve $\frac{\partial u}{\partial x} = 4\frac{\partial u}{\partial y}$, where $u\ (x, 0) = 4e^{-x}$.

OR

Find the z – transform of $f(K) = 4^K, K < 0$
$= 3^K, K \geq 0$

Q.2 a) If $u = a\ (1 + cos\theta)$, find ϑ so that $u + i\vartheta$ is analytic. 05

b) Evaluate $\int_c \frac{(e^z sin2z-1)}{z^2(z+2)^2} dz$ where c is $|z| = \frac{1}{2}$. 05

c) Solve$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$, subject condition $u(0, y) = 0$, $u(\pi, y) = 0$, $u(x, 0) = 100$ and u(x,∞)=0 05

OR

Find the z- transform of $\sin h\frac{K\pi}{2}$. 05

Q.3 a) Show that $u = e^x cosy + x^2 - y^2$ is harmonic. Find harmonic conjugate, also find corresponding analytic function. 05

b) Evaluate $\int \frac{z+2}{z} dz$, where c is left half of the circle |Z| =2. 05

c) Solve $\frac{\partial^2 y}{\partial t^2} = a^2 \frac{\partial^2 y}{\partial x^2}$, subject to the conditions $y(0, t) = y(l, t) = 0$, $y(x, 0) = 0$ and $\left(\frac{\partial y}{\partial t}\right)_{t=0} = \lambda x(l - x)$. 05

OR

Find the inverse Z – transform of $\frac{z^2}{z^2+9}$ 05

Q.4 a) Find the image of the circle |Z-3| = 5 under the transform W=$\frac{1}{Z}$. 05

b) Evaluate $\oint_c \frac{2Z+1}{Z^2-Z-2} dz$, where C is |Z| =3, by Cauchy residue theorem. 05

c) Solve $\propto^2 \frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$, with the boundary conditions $\frac{\partial u}{\partial x}\ (0, t) = 0, \frac{\partial u}{\partial x}\ (l, t) = 0$ and $u(x, 0) = Kx$. 05

OR

Solve $Y_{K+1} - Y_{K-1} = u(k), y(0) = 0$, by Z- transform. 05

Q.5 a) Find the bilinear transformation which maps the points Z=0, $-i$, $2i$ into the points W= $5i$, ∞ , $\frac{-i}{3}$ respectively. 05

b) Expand $f(z) = \frac{z^2-1}{(z+2)(z+3)}$ in a Laurent's series for 2< |Z| < 3. 05

c) Evaluate $\int_0^{2\pi} \frac{d\theta}{13+12cos\theta}$, by residue theorem. 05

2016

Section B

Q.6 Solve any five:- 10

a) Find the Laplace transform of $\frac{sin4\,t}{t}$.

b) Find the Laplace transform of $\left[\frac{d}{dt}\,(t^3e^{-3t})\right]$.

c) Find the Laplace transform of $[a\,cos^2\,2bt]$.

d) Find the inverse Laplace transform of $\frac{1}{s}\left(\frac{s-a}{s+a}\right)$

e) Find the inverse Laplace transform of $\left[\frac{s}{(2s+1)^2}\right]$.

f) Find the inverse Laplace transform of $\frac{Se^{-2s}}{S^2+25}$

g) Find f(x) , if its Fourier sine transform is $e^{-a\lambda}$.

h) Find the Fourier transform of

$$f(x) = 0\,, \infty < x < a$$
$$= x\,, a \le x \le b$$
$$= 0\,, x > b$$

Q.7

a) Evaluate $\int_0^\infty \frac{e^{-t}\,sin\sqrt{3t}}{t}\,dt$. 05

b) Find the inverse Laplace transform of $\frac{1}{2s}\log\left(\frac{s^2+36}{s^2+16}\right)$ 05

c) Solve $\frac{\partial u}{\partial t} = K\,\frac{\partial^2 u}{\partial x^2}$, subject to the conditions 05

1) u= 0 , when x =0, t $\geq$ 0
2) $u = e^{-ax}$, when t =0 , x > 0 and
3) $u(x,t)$ Is bounded.

Q.8

a) Find the Laplace transform of $e^{4t}\int_0^t t\cos t\;dt$. 05

b) Find inverse Laplace transform of $\frac{s}{s^4+8s^2+16}$ by convolution theorem. 05

c) Find the Fourier sine transform of $\cos hx - \sin hx$ 05

Q.9

a) Find the Laplace transform of periodic function. $f(t) = \left(\frac{\pi+t}{2}\right)^2, 0 < t < 2\pi\ and\ f(t) = f(t+2\pi)$. 05

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

c) Solve the integral equation $\int_0^\infty f(x)\sin px\,dx = 1-p\,, 0 \le p \ge 1$ 05

0, P>1

Q.10

a) Express the following function in terms of Heaviside unit step function and hence find their Laplace transform. 05

$f(t) = (t-a)^4, t > a$
$= 0, 0 < t < a$

b) Solve $\frac{dx}{dt} + y = 0\,, \frac{dy}{dt} - x = 0\,, x(0) = 1\,, y(0) = 0$ 05

c) Find the Fourier transform of $f(x)$, where 05

$f(x) = \cos x\ , if\ 0 < x < 1$
$= 0$, Otherwise.

Total No. of Printed Pages:4

SUBJECT CODE NO:- K-34
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E.(Mech/Prod) Examination Oct/Nov 2016
Theory of Machines-I
(Revised)

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

Please check whether you have got the right question paper.

N.B i) Question number 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

i) Which of the following is an inversion of single slider crank chain?
(a) Beam engine (b) Watt's indicator mechanism
(c) elliptical trammels (d) Whitworth quick return motion mechanism

ii) The two links OA and OB are connected by a pin joint$O$. If the link OA turns with angular velocity. ω_1 rad/s in the clockwise direction and the link OB turns with angular velocityω_2 rad/s in the anti-clockwise direction, then the rubbing velocity at the pin joint O is
(a) $\omega._1\,\omega_{2.}\,r$ (b) $(\omega_1-\omega_2)r$ (c) $(\omega_1+\omega_2)r$ (d) $(\omega_1-\omega_2)2r$
where r=Radius of the pin at O.

iii) 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

iv) In a mechanism, the fixed instantaneous centres are those centres which
(a) Remain in the same place for all configurations of the mechanism
(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

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

vi) The component of the acceleration, parallel to the velocity of the particle, at the given instant is called
(a) Tangential component (b) Radial component (c) Coriolis component (d) None of these

vii) When a point at the end of a link moves with constant angular velocity, its acceleration will have
(a) Tangential component only (b) Radial component only
(b) Coriolis component only (d) Radial and tangential components both

viii) The inversion of a mechanism is
(a) Turning its upside down
(b) Changing of a higher pair to a lower pair
(c) Obtained by fixing different links in a kinematic chain.
(d) Obtained by reversing the input and output motion

ix) A combination of kinematic pairs, joined in such a way that the relative motion between the links is completely constrained, is called a
(a) Kinematic chain (b) Inversion (c) Structure (d) Mechanism

x) Which of the following is an inversion of a double slider crank chain?
(a) Oldham's coupling (b) Elliptical trammel (c) Scotch yoke mechanism (d) All of these

Q.2 Figure **1** depicts the structure of Whitworth quick-return mechanism used in reciprocating machine tools. The various dimensions of the mechanism for a specified stroke of the tool are as follows: $OQ = 120\ mm$, $OP = 240mm$, $RQ = 180mm$, and $RS = 600mm$ Crank OP makes an angle of 60^0 with the vertical. Determine the velocity of the slider S (Cutting tool) when the crank rotates at 120 rpm clockwise. Find also the angular velocity of the link RS and the velocity of the sliding block on the slotted lever QT. 15

Q.3 The dimensions of the various links of a mechanism, as shown in **Fig. 2,** are as follows: $OA = 80mm$ $AC = CB = CD = 120mm$ .If the crank OA rotates at 150 r.p.m. in the anticlockwise direction, find, for the given configuration: 15
1. Velocity and acceleration of B and D; 2. Rubbing velocity on the pin at C, if its diameter is 20 mm, and 3. Angular acceleration of the links AB and CD.

Q.4 In the mechanism shown in Figures 3. Crank OA=10 cm and rotates in c. w. Direction at a speed of 100 r.p.m. The straight rod BCD rocks on a fixed pivot at C. BC and CD are each 20 cm long and the link AB=30 cm long. The slider E is driven by the rod DE which is 25 cm long. Locate all the instantaneous centers and find the velocity of point E. 15

Q.5 The following data refer to a steam engine 15
diameter of the piston = 240 mm, stroke length of engine = 480 mm,
length of connecting rod = 900 mm, mass of reciprocating parts = 150 kgs
mass of connecting rod = 100 kg, speed of engine = 150 rpm
centre of gravity of connecting rod from crank-pin = 320 mm
radius of gyration of the connecting about the C. G. = 400 mm
Determine the magnitude and direction of the inertia torque on the crankshaft when the crank has turned 45^0 from the inner dead centre.

Section – B

Q.6 Solve the following questions. (any five) 10

i) The acceleration of the piston in a reciprocating steam engine is given by

(a) $\omega.r\left(\sin\theta + \frac{\sin 2\theta}{n}\right)$ (b) $\omega.r\left(\cos\theta + \frac{\cos 2\theta}{n}\right)$ (c) $\omega^2.r(\sin\theta + \frac{\sin 2\theta}{n})$ (d) $\omega^2.r\ (\cos\theta + \frac{\cos 2\theta}{n})$

Where ω= Angular velocity of the crank r = Radius of the crank,
θ= Angle turned by the crank frominner dead centre, and
n = Ratio of length of connecting rod to crank radius.

2016

ii) The maximum fluctuation of energy is the
(a) Sum of maximum and minimum energies
(b) Difference between the maximum and minimum energies
(c) Radio of the maximum and minimum energy
(d) Ratio of the mean resisting torque to the work done per cycle

iii) The brake commonly used in motor cars is
(a) Shoe brake (b) Band brake (c) Band and block brake (d) internal expanding brake

iv) The angle between the direction of the follower motion and a normal to the pitch curve is called
(a) Pitch angle (b) Prime angle (c) Base angle (d) Pressure angle

v) In reciprocating engines primary forces
a) Are completely balanced
b) Are partially balanced
c) Are balanced by secondary forces
d) Cannot be balanced

vi) The unbalanced force in a single cylinder reciprocating engine is 1. Equal to inertia force of the reciprocating masses, 2. Equal to gas force, 3. Always fully balanced which of the statement (s) is/are correct?
(a) 1 alone (b) 2 alone (c) 1 and 3 (c) 2 and 3

vii) Hammer blow
(a) Is the maximum horizontal unbalanced force caused by the mass provided to balance the reciprocating masses?
(b) Is the maximum vertical unbalanced force caused by the mass added to balance the reciprocating masses.
(c) Varies as the square root of the speed
(d) Varies inversely with the square of the speed

viii) The couple will balance one another couple when they are in the same plane and
(a) Have unequal moments and their direction of rotation is opposite
(b) Have equal movements and their direction rotation is same
(c) Have equal movement and their direction of rotation is opposite
(d) None of the above

ix) In balancing of 4-stroke in line engines, firing order helps to control the magnitude of
(a) Primary forces only (b) Secondary forces only
(c) Primary forces and primary couples only (d) Primary and secondary couples only

x) The method of direct and reverse cranks is used in engines for
(a) The control of speed fluctuations (b) Balancing of forces and couples
(c) Kinematic analysis (d) Vibration analysis

Q.7 Draw the profile of a cam to impart the following motion to a flat-faced follower: 15
(i) Follower to move outward through a distance of 50 mm during 150^0 of cam rotation with SHM.

(ii) Follower to dwell for the next 30^0 of cam rotation

(iii) Follower to return to its initial position through during 150^0 of cam rotation with uniform equal acceleration and retardation motion.

The line of stroke of the follower passes through the axis of rotation of the cam and the flat face of the follower is at right angles to the axis of the reciprocating follower.

Q.8 Describe with the help of a neat sketch the principles of operation of an internal expanding shoe. Derive the expression for the braking tourqe. 15

Q.9 Four masses m1, m2, m3, and m4 having 100, 175, 200 and 25 kg are fixed to cranks of 20 cm radius and revolve in places 1, 2, 3 and 4. The angular position of the cracks in planes 2,3 and 4 with respect to the crack in plane 1 are 750, 1350 and 2000 taken in the same sense. The distance of planes 2,3 and 4 from plane 1 are 60 cm, 186 cn and 240 cm respectively. Determine the position and magnitude of the balance mass at a radius of 60 cm in plane L and M located at middle of the plane 1 and 2 and the middle of the planes 3 and 4 respectively. 15

Q.10 A two cylinder uncoupled locomotive has inside cylinders 60 cm apart. The radius of each crank is 30 cm. The cracks are at right angles. The weight of the revolving mass per cylinder is 2452.5 N and the weight of the reciprocating mass per cylinder is 2943 N. The whole of the revolving and 2/3 rd of the reciprocating masses are to be balanced and the balanced weight are placed, in the planes of rotation of the driving wheels, at radius of 80 cm. The driving wheels are 2 m in diameter and 1.5 m apart. If the speed of the engine is 80 km/hr, find the hammer blow, maximum variation of tractive effort and maximum swaying couple. 15

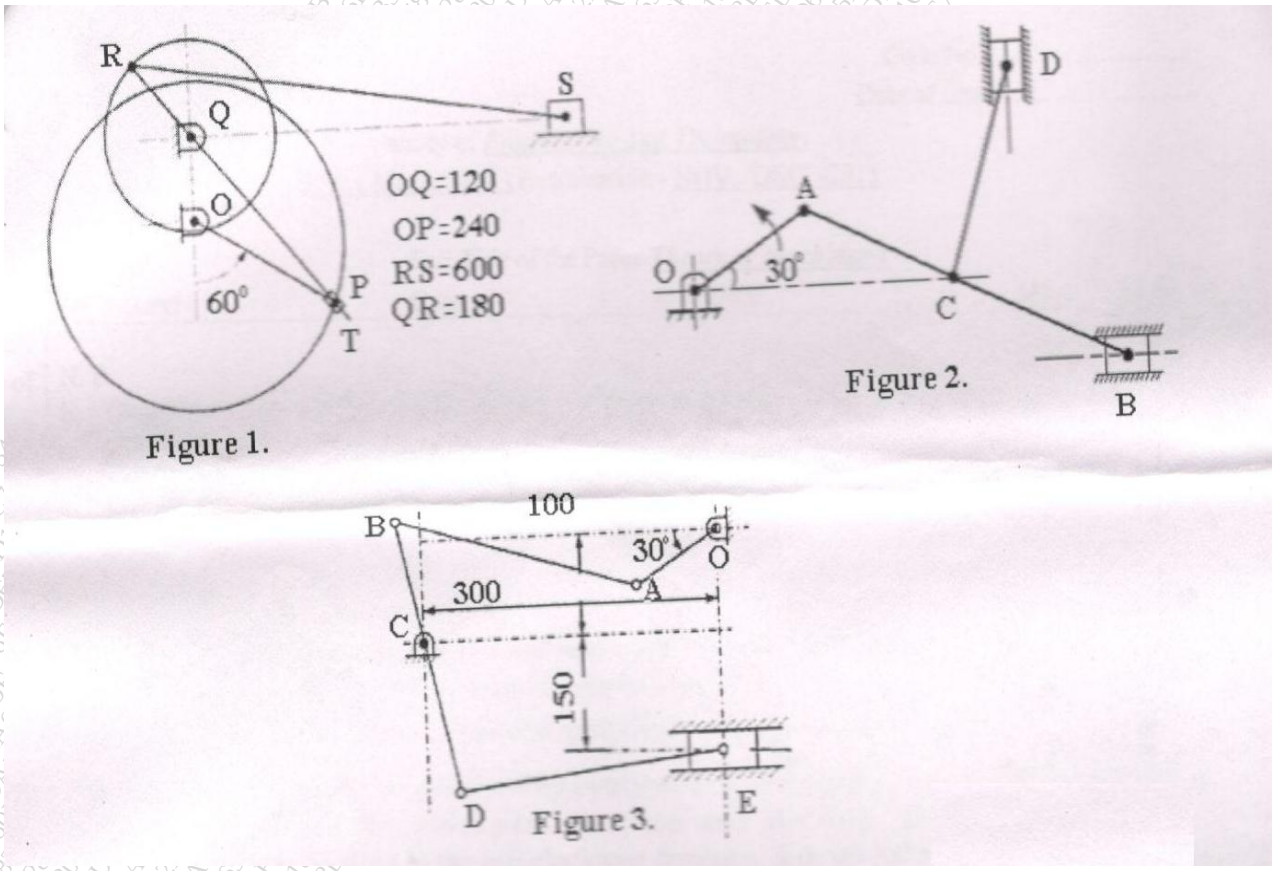


Figure 1.

Figure 2.

Figure 3.

Total No. of Printed Pages:2

SUBJECT CODE NO:- K-64
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E.(Mech/Prod) Examination Oct/Nov 2016
Thermodynamics-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) Attempt any two questions from the remaining questions in each section.
iii) Use of steam tables, Mollier charts, non-programmable calculator is permitted .
iv) Assume suitable data, if necessary.

Section A

Q.1 Solve any five. 10

a) Explain the criteria for selection of boiler.
b) Discuss 'forced circulation and natural circulation 'boilers.
c) State the difference between 'fire tube and water tube' boilers.
d) Define factor of evaporation and equivalent evaporation.
e) Explain high pressure boilers.
f) Enumerate and explain heat losses in boiler plant.
g) What is steam nozzle? List the types of steam nozzle.
h) Discuss the functions of the convergent portion, the throat and the divergent portion of a convergent – divergent nozzle with reference to flow of steam.

Q.2 a) Explain IBR laws. 07

b) A boiler generates 45000 kg/hr of steam at 18 bar the steam temperature being 325 ^{0}C. The feed water temperature is 49.2 ^{0}C. The efficiency of the boiler is 80 % . When using oil of calorific value 44500 kJ/kg, the steam generated is supplied to a turbine developing 500 kW , and exhausting at 1.8 bar, the dryness of exhaust steam is 0.98. Calculate the oil burnt per hour. Also find the energy available in the exhaust steam. 08

Q.3 a) Show that, $\frac{T_g}{T_a} = 2 \times \left(\frac{m_a+1}{m_a}\right)$where , Tg is hot gas (chimney gas) temperature and Ta is outside air temperature. 08

b) Find the draught in mm of water column produced by a chimney 36 m high when the mean temperature of hot gases is 300^{o}C, the temperature of outside air is 27^{0}C and 19 kg of air is supplied per kg of fuel burnt in the furnace. 07

Q.4 a) Explain the metastable expansion of steam in a nozzle. 07

b) Derive the equation of mass of steam discharged through nozzle. 08

Q.5 Write short notes on (any two) 15

a)Loeffler boiler
b) Artificial draught
c) Effect of super saturation

2016

Section -B

Q.6 Solve any five : 10

a) Explain the term 'vacuum' .How is it measured?
b) Explain condenser? List the classification of condenser.
c) Define vacuum and condenser efficiency.
d) Discuss the effect of lowering the condenser pressure.
e) Explain effect of inlet and back pressure on performance of Rankine cycle.
f) Discuss in short the modified Rankine cycle.
g) Explain centrifugal compressor.
h) Show on p-V and T-s plane, the compression in the compressor having index of compression n=1 ,n=1.2 ,n=1.4.

Q.7 a) Explain the effect of air leakage in a condenser. What are the sources of air into the condenser? 07

b) The air entering a steam condenser with steam is estimated at 6 kg/hr . The temperature at inlet to air cooler section is 30 ^{o}C and at the outlet 26°C. The vacuum in the shell is essentially constant throughout and is 721 mm of Hg, while the barometer reads 758 mm of Hg. Calculate , i) volume of air entering the cooling section per hour, ii)mass of moisture contained in air , iii) mass of steam condensed per hour in the cooling section. 08

Q.8 a) Explain the effect of boiler pressure and temperature on efficiency of Rankine cycle. 08

b) In a steam power cycle, the steam supply is at 15 bar and dry and saturated. The condenser pressure is 0.4 bar. Calculate the Carnot and Rankine efficiencies of the cycle. Neglect pump work. 07

Q.9 a) Air is to be compressed in a single stage reciprocating compressor from 1 bar and 15°C to 10 bar. Calculate the indicated power requied for FAD of 0.3 m^3/ min . The compression process follows the law of $pV^{1.25}$ = constant . 08

b) For minimum work condition for two stage air compressor show that intermediate pressure (p_2)is square root of product of p_1 and p_3 . 07

Q.10 Write short notes on (any two) 15

a) Surface condenser
b) Effect of superheat on Rankine cycle
c) Vacuum pump

Total No. of Printed Pages:2

SUBJECT CODE NO:- K-94
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (Mech/Prod) Examination Oct/Nov 2016
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 any two questions from remaining in each section.

SECTION A

Q.1 Solve any Five :- 10
i. Give the classification electrical drives.
ii. Differential between electrical & mechanical drives.
iii. Explain the starting mechanism of DC motor.
iv. Explain the concept of plugging.
v. Differential between squirrel cage motor & slipring motor.
vi. Draw the construction of universal motor.

Q.2 (a) Explain the group drives with suitable example. 07
(b) Draw the chopper circuit for speed control of DC motor. 08

Q.3 (a) What are selection criteria for electrical drives for any application, give details? 07
(b) Explain the speed torque characteristics of DC drives & shunt motor. 08

Q.4 (a) Explain the construction & working of 3 – phase induction motor. 07
(b) Explain DC servo motors. 08

Q.5 (a) Write a note on VIF control of AC motors. 07
(b) Explain the concept of rotating magnetic field with suitable example. 08

SECTION B

Q.6 Solve any Five :- 10
i. Enlist applications of Temperature sensors.
ii. Draw & explain load cell.
iii. What is operating principle of airflow sensors?
iv. Enlist various types of actuators.
v. Draw & explain construction of a relay.
vi. What is buzzer?

Q.7 (a) Draw & explain shaft encoder in detail. 07
(b) Explain starter as an actuator with suitable example. 08

Q.8	(a)	Draw & explain thermocouple in detail.	07
	(b)	Explain construction & working of 7 – segment displays.	08
Q.9	(a)	What is heat sink? With the help of suitable example, explain its need & working.	07
	(b)	Explain construction of SCR & with a note on triggering methods of it.	08
Q.10	(a)	Write a note on sequential timer circuit.	07
	(b)	Write a note on Flash circuit.	08

Total No. of Printed Pages:2

SUBJECT CODE NO:- K-161
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E.(Mech/Prod) Examination Oct/Nov 2016
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 & Q.No.6 from section B are compulsory.
ii) Solve any two questions from each section other than Q. No. 1 & Q.6.
iii) Figures to the right indicate full marks.

Section A

Q.1 Solve any five of the following 10
a) Define tool life. How it is expressed?
b) Enlist the principles of metal cutting
c) Enlist various types of cutting fluids
d) Define machine tool and give its functions
e) What is the difference between speed lathe & centre lathe
f) Explain straddle milling
g) Explain down milling
h) Enlist different types of lathe
i) Define mechanisation & automation
j) Enlist diff. Types of cutting tool materials.

Q.2 a) Explain different types of tool angle for a single point cutting tool 08
b) Define speed, feed & depth of cut. Also state its effect on tool life. 07

Q.3 a) Explain principal parts of lathe. 07
b) Explain taper turning procedure on lathe. 08

Q.4 a) Explain gear hobbing. 08
b) Differentiate between UP milling & down milling. 07

Q.5 a) Explain the heat sources doing machining. 07
b) Give classification of milling machine & explain universal milling machine. 08

Section B

Q.6 Solve any five of the following 10
a) Explain working principle of broaching
b) Enlist types of grinding wheels
c) Define abrasive. Enlist its types
d) Classify non-traditional machining processes
e) Enlist types of grinding machines
f) Explain the term structure for grinding wheel.
g) Enlist different drilling operations
h) Which are the limitations of broaching?
i) Give classification of shaper.
j) Enlist tool holding devices for drilling

2016

Q.7	a)	Explain principal parts of slotter	07
	b)	Explain various operations performed on shaper.	08
Q.8	a)	Explain JIG boring machine.	07
	b)	Explain tool holding & work holding devices of drilling machine.	08
Q.9	a)	Write a short note on electrochemical grinding	08
	b)	Explain plasma are machining. Give its merits & demerits.	07
Q.10	a)	What is Grit, Grain, Structure of grinding wheel. Explain in detail	08
	b)	Explain principle parts of broach.	07

Total No. of Printed Pages:3

SUBJECT CODE NO:- K-185
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E.(ALL-BRANCHES) Examination Oct/Nov 2016
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 out of Q. 2, 3, 4 & 5.
iii. Solve any two out of Q. 7, 8, 9& 10.
iv. Use of Non-programmable calculator is allowed.
v. Figures to the right indicate full marks.
vi. Assume suitable data, if necessary.

Section A

Q.1 Solve any five 10

a) Find C.F. of $\frac{d^2x}{dt^2} + 3a\frac{dx}{dt} - 4a^2x = 0$
b) Solve $(D^3 - 3D^2 + 3D - 1)y = 0$
c) Find P.I of $(D+2)(D-1)^2y = e^{-2x}$
d) Find P.I of $(D^2 - 4)y = x^2$
e) If the probability of a defective mobile phone is 0.2, find the
   I. Mean
   II. The standard deviation for the distribution of mobile phones in a total of 200.
f) Suppose 3% of bolts made by machine are defective the defects occurring at random during production if bolts are packaged 50 per box find Poisson approximation to it that a given box will contain 5 defectives.
g) There is no skewness in the distribution if ----------.
h) Draw the electrical circuit that gives damped free oscillations.

Q.2 a) Solve $(D^2 + 13D + 36)y = e^{-4x} + cos2x$ 05

b) Find the Karl Pearson's coefficient of skewness for the following 05

Years under	10	20	30	40	50	60
No. of persons	15	32	51	78	97	109

c) An alternating $emfE \sin \omega t$ is applied to an inductance L and capacitance C in series. Show that ,the current in the circuit is $\frac{EW}{(n^2-w^2)L}(coswt - cosnt)$ where $\eta^2 = \frac{1}{LC}$ 05

Q.3 a) Solve by method of variation of parameters. $(D^2 + 2D + 1)y = 4e^{-x}\log x$ 05

b) Apply the method of the least squares to fit a parabola $y = a + bx + cx^2$ for the data. 05

X	-1	0	0	1
Y	2	0	1	2

c) Solve $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = \sin(logx^2)$ 05

Q.4 a) An underground mine has 5 pumps installed for pumping out storm water. The probability of any one of the pumps failing during the storm is $\frac{1}{8}$. what is the probability that 05

I. At least 2 pumps will be working

II. All pumps will be working during a particular storm.

b) A body executes damped forced vibrations given by the equation $\frac{d^2x}{dt^2} + 2K\frac{dx}{dt} + b^2x = e^{-kt}\sin wt$. solve the equation for both the cases, when $w^2 \neq b^2 - k^2$ and $w^2 = b^2 - k^2$. 05

c) Solve $(2x+1)\frac{d^2y}{dx^2} - \frac{dy}{dx} + \frac{y}{2x+1} = \frac{3x+4}{2x+1}$ 05

Q.5 a) The first four moments of a distribution about the value 4 of the variable are −1.5, 17,-30 and 108. Calculate the first four moments about the mean and find β_1 and β_2. 05

b) Solve the equation $EI\ \frac{d^2y}{dx^2} + Py = \frac{-wl^2}{8}\sin\left(\frac{\pi x}{l}\right)$ for a strut of length 'l' freely hinged at each end. Prove that the deflection y at the centre is $\frac{wl^2}{8(Q-P)}$ where $Q = \frac{EI\pi^2}{l^2}$ 05

c) Solve by general method $(D^2 + 3D + 2)y = e^{e^x}$ 05

Section – B

Q.6 Solve any five 10

a) Find the first approximate value of the root $(ie.\ x_1)$ by Newton – Raphson method for $\log_e x - x + 3 = 0$.

b) Find the values of x, y, z in the first iteration by Gauss Seidel Method for

$8x + 3y + 2z = 13$

$x + 5y + z = 7$

$2x + y + 6z = 9$

c) Find f(1) for data

X	0	2	3
F(x)	-4	2	14

d) Find grad ∅ at (1,1,-1) if $\emptyset = e^{2x-y+z}$.

e) Prove that $\bar{F} = (y^2 cosx + z^3)i + (2y\ sinx - 4)j + (3xz^2 + 2)K$ is conservation field.

f) If $\bar{A}(t) = ti - t^2j + (t-1)K$

$\bar{B}(t) = 2t^2i + 6tk$

Evaluate $\int_0^2 \bar{A}.\bar{B}\ dt$.

g) If $\bar{r} = xi + yj + zk$ then find $\nabla.\bar{r}$.

h) Write formula of Runge Kutta IVth order method to solve $\frac{dy}{dx} = f(x,y), y(x_0) = y_0$

Q.7 a) Find the root of the equation $e^{-x} - x = 0$ by Newton –Raphson method (correct to three decimal places). 05

b) Find the directional derivation of $\emptyset = xy^2 + yz^3$ at the point (2,-1, 1) in the direction of the normal to the surface $xlogz - y^2 = -4$ at (-1,2,1). 05

c) If $\bar{F} = (5xy - 6x^2)i + (2y - 4x)j$, evaluate $\int_c \bar{F}.d\bar{r}$ along the curve C in $x - y$ plane, $y = x^3$ from the point (1, 1) to (2, 8). 05

Q.8 a) Solve by Gauss Seidel method 05

$28x + 4y - z = 32$

$x + 3y + 10z = 24$

$2x + 17y + 4z = 35$

2016

b) Verify Green's theorem for $\bar{F} = x^2 i + xyj$ and C is a triangle having vertices A (0, 2), B (2, 0) and C (4, 2). 05

c) Find $\nabla^4(e^r)$. 05

Q.9

a) Given that $\frac{dy}{dx} = 2 + \sqrt{xy}$ and y(1)=1 find approximate value of y at $x = 1.2$ using Euler's modified method (take $h = 0.2$) 05

b) Use Lagrange's interpolation to find the value of y when x=10 for the data given below. 05

X:	5	6	9	11
Y:	12	13	14	16

c) Using stoke's theorem evaluate $\int_c [(x + y) + (2x - z)dy + (y + z)dz]$ where C is the boundary of the triangle with vertices (2,0,0) (0,3,0) and (0,0,6). 05

Q.10

a) Evaluate $\int_c \bar{F}.d\bar{s}$ where 05
$\bar{F} = yi + xj + z^2 k$ over the cylindrical region bounded $by\ x^2 + y^2 = 9, z = 0$ and $z = 2$.

b) From the following table find the value of $\frac{dy}{dx}$ at $x = 2.03$. 05

X:	1.96	1.98	2.00	2.02	2.04
Y:	0.7825	0.7739	0.7651	0.7563	0.7473

c) Use fourth order Runge Kutta method to find y at $x = 0.1$ given that $\frac{dy}{dx} = 3e^x + 2y, y(0) = 0\ and\ \ h = 0.1$. 05

Total No. of Printed Pages:3

SUBJECT CODE NO:- K-309
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E.(Mech/Prod) Examination Oct/Nov 2016
Strength of Material
(Revised)

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

Please check whether you have got the right question paper.

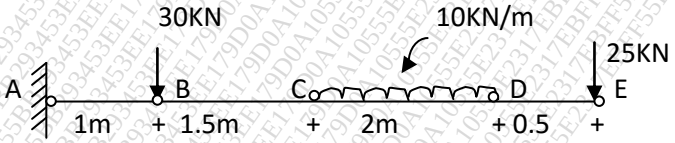
N.B i) Q.No.1 and Q.No.6 are compulsory.
ii) Solve any two questions from remaining questions for each section.
iii) Assume suitable data if necessary.

Section A

Q.1 Attempt any five. 10

1) Define modulus of rigidity.
2) Define shear stress.
3) Define factor of safety.
4) Define point of contra shear.
5) Enlist types of beam.
6) Enlist the types of load.
7) Write down flexural formula.
8) Define section modulus.

Q.2 a) Define shear force & bending moment. 03
b) Draw S.F.D & B.M.D for the cantilever shown in figure. 12



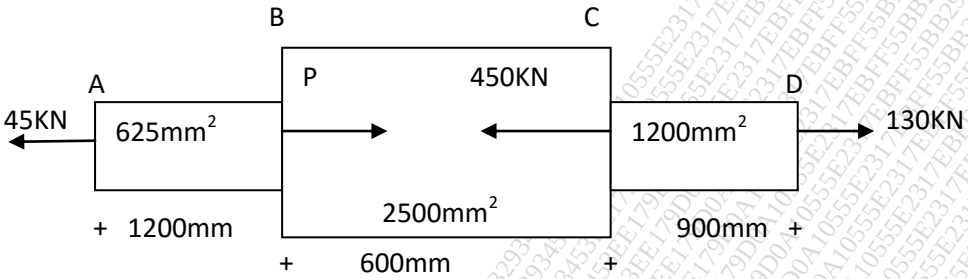
Q.3 a) Derive the relation between E, G & K ie. 07
E=9 KG/ 3K+G
b) A steel pipe is 30m in length at a temperature of 15^0C. Its temperature increases to 170^0C. Calculate its final length, it this increase in length is prevented. Also find stress induced in the pipe. 08
Take E= 200GPa and $\alpha = 11 \times 10^{-6}/°C$.

Q.4 a) A cantilever beam of uniform c/s section 150 ×300mm rectangular, carries U.d.L of 20 KN/m over its span 2m. Determine the maxim bending stress anywhere in the beam. 07
b) Derive flexural formula. 08
$M/_I = E/_R = E/_y$

Q.5 a) A composite bar having copper rod 36mm dia. Is rigidly attached to both ends to the inside of steel tube which 50mm in external diameter & thickness of 5mm. The composite bar is subjected to an axial pull of 100KN. Find stress induced in each metal. Es=200KN/mm^2 & Ec=110KN/mm^2. 08

2016

b) A member ABCD is subjected to point load as shown in fig. Find 'P' & total elongation. 07



Take $E = 2.\times 10^5$MPa

Section B

Q.6 Attempt any five. 10

1) Define resilence.
2) Write down the torsional formula.
3) Define longitudinal stress.
4) Define principal plane & principal stress.
5) Write down assumptions made in theory of torsion.
6) Define slope & deflection of beam.
7) Define major principal plane.
8) Define eccentricity.

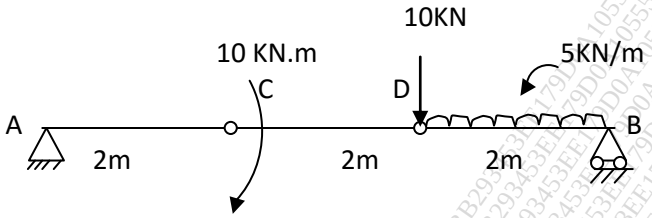
Q.7 a) A steel rod is 60mm in diameter, a gun metal sleeve is provided over this rod for the entire length. It is securely fixed over the shaft to form a composite member which is subjected to torque. If the torque on gun metal sleeve is twice the torque on the steel rod. Find the thickness of the sleeve. Take = Gs =80 GPa. Gg= 30 GPa 08

b) A short column of external diameter 400mm & internal diameter 200mm carries an eccentric load of 80KN. Find the greatest eccentricity which the load can have without producing tension on the cross-section. 07

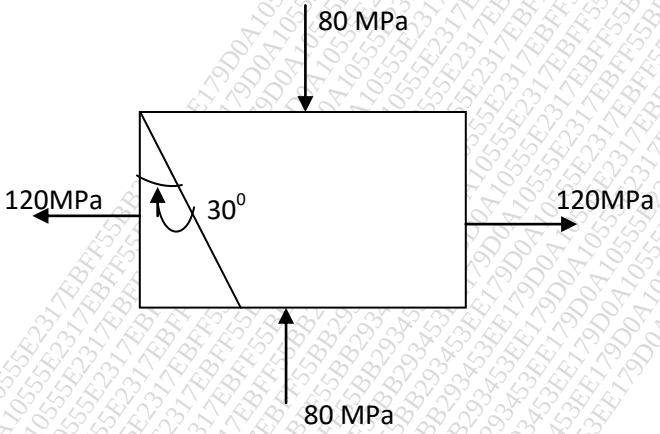
Q.8 a) A cylindrical shell is 3m long, 1m in dia & is subjected to an internal pressure of 1N/mm^2. If the thickness of shell is 20mm. Find the circumferential & longitudinal stress. 07

b) A tensile load of 60KN is suddenly applied to a circular rod of 40mm dia & 5m long. If the value of E=200 GPa. 08
Determine:
1) Maximum instantaneous stress in rod.
2) Strain energy absorbed by the rod.

Q.9 A beam AB of 6m span is simply supported at the ends & is loaded as shown in fig. 15
Take $E = 2 \times 10^5 N/mm^2, I = 60 \times 10^6 mm^4$. find position & magnitude of maximum deflection. Using Mc-Cauley's method.



Q.10 a) A point in strained material is subjected to a tensile stress of 120 N/mm^2 & compressive stress of 80 N/mm^2 acting at right angle to each other. Find normal stress, tangential stress & the resultant stress on a plane inclined at an angle of 30^0 with the compressive stress. 08



b) Derive the torsional formulas. 07

2016

Total No. of Printed Pages:3

SUBJECT CODE NO:- K-211
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E.(MECH/PROD) Examination Oct/Nov 2016
Machine Drawing
(Revised)

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

Please check whether you have got the right question paper.

N.B i) All questions are compulsory.
ii) Figure to the right indicates full marks.
iii) Assume suitable data if and wherever necessary.

Section A

Q.1a) The foci of an ellipse are 90 mm apart and the minor axis is 65mm long. Determine the length of the major axis and draw half the ellipse by concentric circles method and other half by oblong method. 08

b) Construct a hypocycloid, rolling circle of 50mm diameter and directing circle of diameter 175 mm .Draw a tangent and a normal to the curve at a point 50mm from the center of the directing circle. 08

Q.2 Fig.No.1 shows front view, and left hand side view of an object. Draw the following view:- 12

a) Redraw front view and left hand side view
b) Top view
c) Auxiliary view from the direction of arrow B

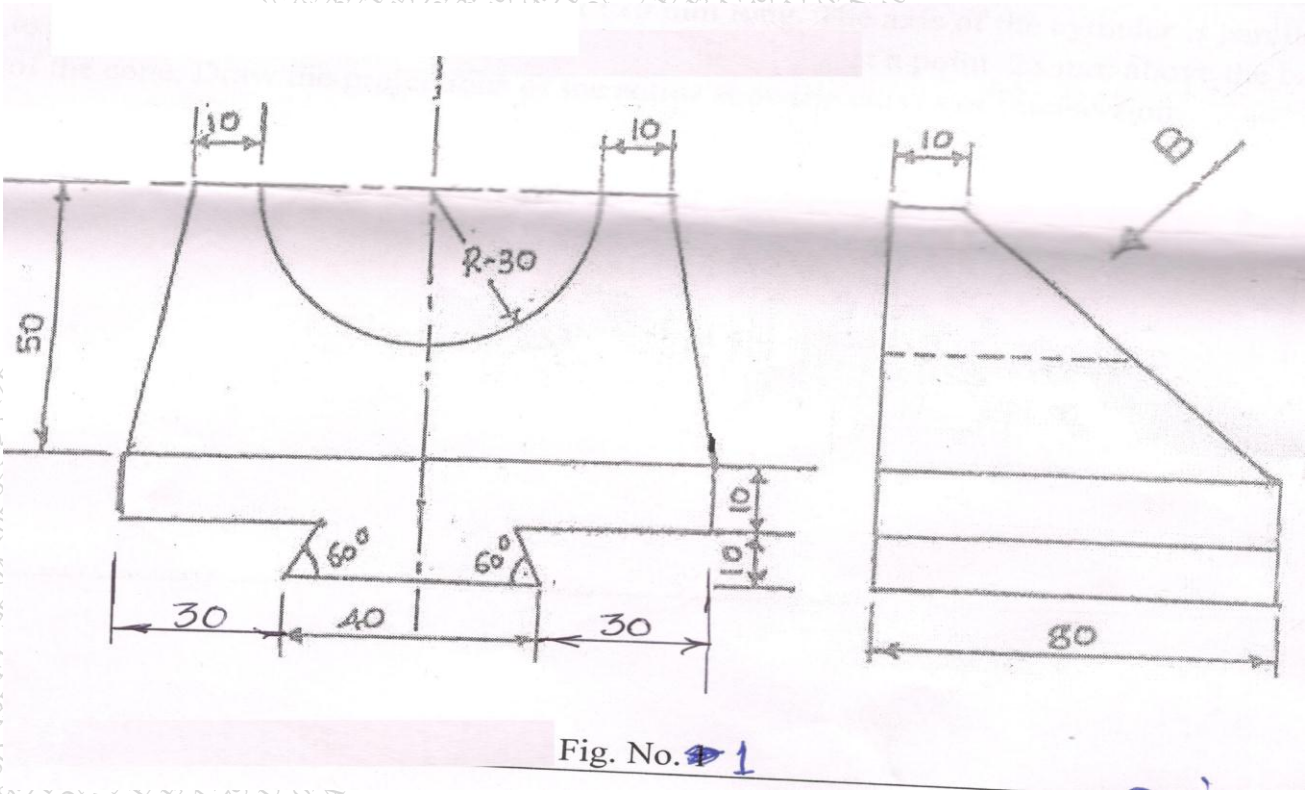


Fig. No. 1

OR

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

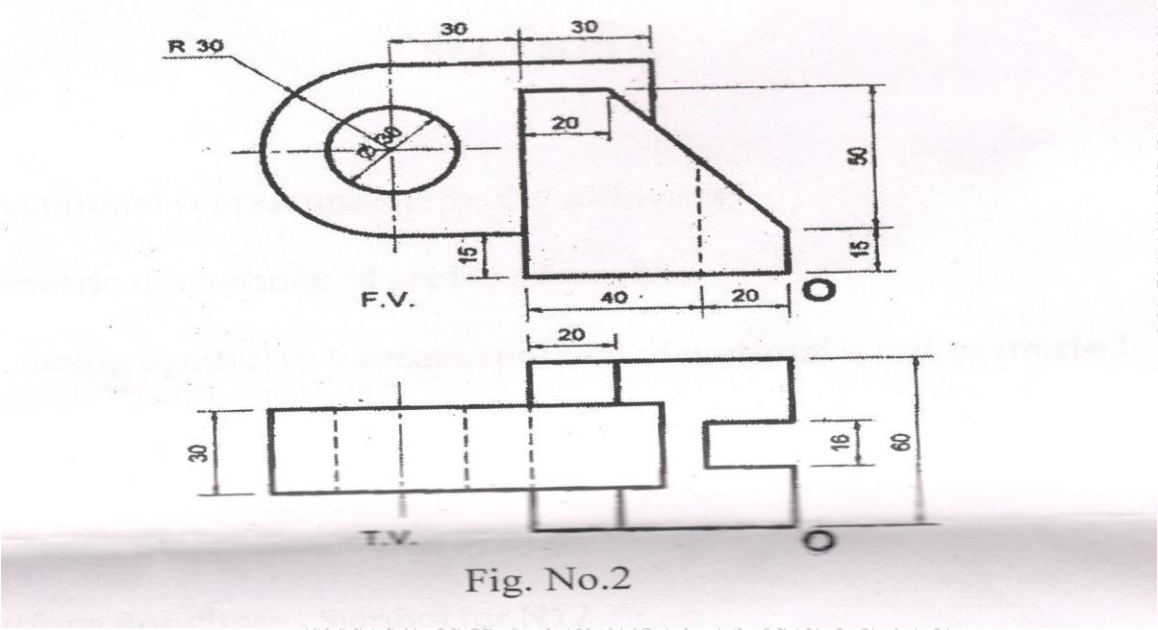


Fig. No.2

Q.3 A vertical square prism of base 50mm side and height 100mm with a side of base inclined at 30° to the V.P it is penetrated by another square prism of base 40mm side and height 120mm long, faces of which are equally inclined to the V.P Axes of the two prisms are parallel to the V.P and bisects each other at right angles Draw the projections showing the lines of intersection. 12

OR

A vertical cone, base 75mm diameter and axis 100mm long is completely penetrated by a cylinder, 45 mm in diameter and 120mm long. The axis of the cylinder is parallel to both H.P and V.P and intersects the axis of the cone at a point 28mm above the base of the cone, Draw the projections of the solids showing curves of intersection. 12

Section -B

Q.4 Draw the conventional representation for the following 15

1. Draw the geometrical tolerance of profile of any line.
2. Draw the Machining symbol to indicate removal of material is not permitted.
3. Holes on circular pitch.
4. Angular dimensions of Uni-directional system.
5. Equivalent Surface Roughness symbol for N12
6. Position of weld symbol.
7. Equivalent surface Roughness symbol for N3.
8. Cylindrical compression spring.
9. Draw the geometrical tolerance of Angularity.
10. Geometrical tolerance of Run out.
11. Square butt weld.
12. Clearance fit.
13. Surface texture obtained without removal of material.
14. Datum as exact geometric reference.
15. Worm wheel.

Q.5 Fig.no.3 below shows the details of the tail stock. Assemble all the parts, tabulate the part list and draw 25

1. Half sectional front view and 2) side view

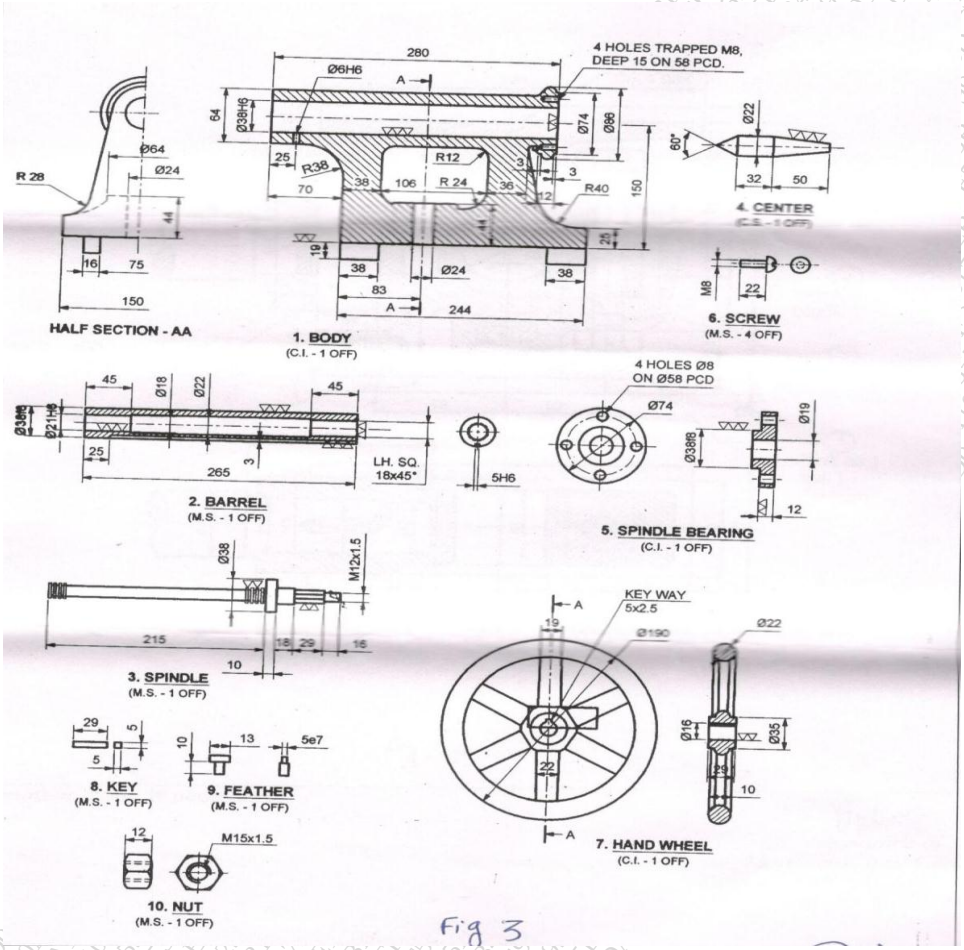


Fig 3

OR

Refer to given figure no.4 which shows assembly drawing of steam engine cross head. Draw the details drawing in two views and give the part numbering as per part list. 25

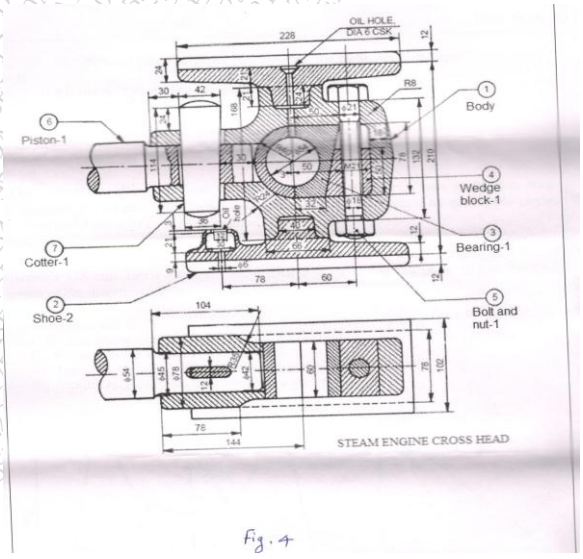


Fig. 4

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Total No. of Printed Pages:2

SUBJECT CODE NO:- K-242
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E.(MECH/PROD) Examination Oct/Nov 2016
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 from each section.
iii) Use of stem table/mollier diagram allowed.
iv) Assume suitable data, if required.

Section A

Q.1 Solve any five. 10
a) Explain control volume.
b) Modify SFEE for adiabatic horizontal nozzle.
c) State Carnot theorem.
d) Explain available energy.
e) Differentiate between heat pump & refrigerator.
f) State the assumptions of SFEE.
g) Draw adiabatic process of P-V4 T-S diagram.
h) Define flow work.

Q.2 a) Explain PMM-I & PMM-II. 06
b) A centrifugal pump delivers 50kg of water per second. The inlet & outlet pressure are - $0.1MP_a$ & $0.42MP_a$ respectively. The suction is 2.2m below the centre of the pump & delivery is 8.5m above the centre of pump. The suction & delivery pipe diameter are 25cm & 15cm respectively. Determine the capacity of electric motor to run the pump. 09

Q.3 Two Carnot engines are working in series between source & sink. The first engine receives heat from reservoir at a temperature of 1000 K & rejects heat to another reservoir at temperature T_2. The second engine receives the heat energy rejected by first engine & rejects heat to sink at temp of 300 K. Find temperature 'T_2' if (i) power output of both is same (II) both engines have same efficiency. 15

Q.4 a) A mass m of a fluid at a temperature T_1 is mixed with an equal mass of the same fluid at a temperature T_2. Prove that the resultant change of entropy of the universe is 08

$$\frac{2mC_p\, l_n\,(T_1+T_2)}{2\sqrt{T_1.T_2}}$$

b) Explain the principle of increase in entropy of the universe. 07

Q.5 Write short notes on (any three) 15
a) Limitation of 1st law of thermodynamics.
b) Carnot cycle
c) Heat engine
d) Kelvin plank & Clausis statement

2016

Section B

Q.6 Solve any five 10

a) Draw Brayton cycle on P-V & T-S diagram.
b) How much heat is liberated by complete combustion of 5kg of fuel having calorific value 30,000kj/kg?
c) State assumptions of power cycles.
d) Explain i) Wet steam ii) Dry steam
e) Draw Ericson's cycle on P-V & T-S diagram.
f) What is specific heat?
g) Enlist the devices used to measure dryness fraction of seam.
h) What is compression ratio?

Q.7 A four stroke, 4 cylinder petrol engine of 250mm bore & 375mm stroke works on Otto cycle. The clearance volume is$0.01052\ m^3$. The initial pressure & temperatures are 1 bar & 27°C. If the maximum pressure is 25 bar. Find 15

i)Pressure & temperature at all points
ii) Thermal efficiency
iii) Mean effective pressure

Q.8 a) A pressure cooker contains 2kg of dry & saturated steam at 5bar. Find the quantity of heat that must be rejected so as to reduce quality upto 60% dry. Also find pressure & temp at new state. 08

b) With neat sketch, explain working of separating calorimeter. 07

Q.9 a) Explain flue gas analysis by using orsat apparatus. 05

b) The dry exhaust gas from an oil engine has the following composition by volume. 10
CO_2=8.85%, CO=1.2%, O_2=6.8% & N_2=83.15%
The fuel has % composition by mass as C=84%, H_2=16% determine.
a) Mass of carbon per kg of dry flue gases.
b) The Air-fuel ration by mass.

Q.10 Write short note on (any three) 15

a) Otto cycle
b) Concept of air standard cycle
c) Phase change diagram of pure substance
d) T-S diagram

Total No. of Printed Pages:2

SUBJECT CODE NO:- K-275

FACULTY OF ENGINEERING AND TECHNOLOGY

S.E.(Mech/Prod) Examination Oct/Nov 2016

Production Processes-I

(Revised)

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

Please check whether you have got the right question paper.

N.B i)Solve in all three questions from each section.
ii)Question No.1 and Q. No.6 are compulsory
iii)Figurs to the right indicate full marks.

Section A

Q.1 Solve Any Five. 10

i) Define pattern and core.
ii) How a cupola is specified?
iii) List the common allowances provided on pattern.
iv) What is meant by term risening?
v) Define the cold forging operation.
vi) Define impact extrusion process .
vii) Define flash in forging.
viii) Explain roll bending operaion.
ix) State the applications of investment casting.
x) Define lancing and nibbing operation.

Q.2 a) Explain true centrifugal casting process with the help of neat sketch. 08
b) With neat schematic diagram explain hot chember die casting. 07

Q.3 a) Describe the constructional features of a cupola furnace with neat sketch. 06
b) What are the various elements that comprise of the gating system? Explain. 09

Q.4 a) Explain the principle of rolling with the help of neat sketch. 05
b) With neat sketch explain direct and backward extrusion process. also write down advantages and limitations of hot extrusion. 10

Q.5 a) Define the following sheet metal operation with the help of neat sketch. 08
i)Lancing ii) Piercing iii)Slitting iv)Nibbling.

b) Explain mechanical press with neat sketch. 07

Section B

Q.6 Solve any Five out of the following. 10

i) Define laser welding.
ii) What is a bead?
iii) Write principle of thermit welding.
iv) What is flux.
v) List the major defects in welding.
vi) Define electroplating.
vii) Enlist types of coatings.
viii) What are plastics?
ix) Classify plastics forming and fabrication processes.
x) Define powder metallagy.

Q.7	a)	State briefly galvanizing with advantages and limitations.	07
	b)	Write short note on:- i)Metal spraying ii) Polishing.	08
Q.8	a)	With neat sketch explain the working principle of shielded metal arc welding process.	07
	b)	Explain the TIG and MIG systems of arc welding. Give application of each.	08
Q.9	a)	Describe the types of flames obtained in an oxy-acetylence gas welding process giving the application.	08
	b)	Explain Thermit welding, add suitable diagram.	07
Q.10	a)	Write short note on the following:- i)Injection moulding ii) Blow moulding.	10
	b)	Explain rotational moulding process in detail.	05